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DIAGNOSTIC SIGNIFICANCE OF ABDOMINAL PAIN.

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Pain is so predominant a symptom of disease, that its proper interpretation becomes the first object of the diagnostician. Pain has been defined as a disagreeable sensation due to the stimulation of some portion of the cerebro-spinal nervous system, referred to the peripheral distribution of the cerebro-spinal sensory nerves in the external body wall (MacKenzie). If this be a true definition, it necessitates intimate knowledge of the factors that go to make up this complex.

EMBRYOLOGY.

Confining ourselves to the abdomen, we may state a few fundamental embryologic and anatomic facts to clear the way to a better understanding of this all-important cavity. The embryonic development of the gastro-intestinal tract is by a single tube occupying the mid-line and divided, into fore-gut, mid-gut and hind-gut. From the fore-gut is developed all of the organs that have to do with the digestive elaboration of food, therefore the stomach, liver, biliary tract and pancreas are all outside of this single segment. The mid-gut is largely concerned with the completion of digestion and partial absorption of the digested foodstuffs and the hind-gut, with the completion of absorption and the evacuation of waste products.

The sympathetic nervous system of the abdomen in embryo occupies the same mesial line as the embryonic gut tube, lying immediately posterior to it. As the embryonic development approaches completion, the organs are arranged in their natural positions, the stomach enlarging and having an axis from above downward and slightly from left to right, the liver occupying the dome of the diaphragm with its biliary apparatus on its under surface, the pancreas lying transversely in the upper abdomen and the numerous coils of the intestine filling the rest of the cavity, and yet the autonomic nerve center of all these structures remains in its original position in the median line.

CLASSIFICATION OF PAIN.

Abdominal pain falls into two great phases, depending upon the exciting causes of its development, first the pain of irritation, characterized by deranged function, and secondly, exudative or inflammatory pain with suspended function. In the first phase, two important factors in pain interpretation are explained by the embryologic facts. First, the mesial character of subjective pain, that is, the primary area of irritative pain interpretation is the mid-line from the ensiform to the symphysis. If this line is divided into sections, that portion behind the ensiform represents subjective pain referable to the esophagus; the section from the ensiform to a point two inches above the umbilicus, the stomach; from this point midway to the symphysis, the small intestine; and the lowest section of the line, the large intestine. Second, the "law of average localization", meaning that the brain develops a sense of interpretive location for efferent nerve impulse as belonging in one definite locality, for example, irritation of a section of small intestine, whatever its position, will have its sense of pain transmitted to the region of the umbilicus. This explains the more accurate localization of pain for fixed organs and the less accurate for freely movable ones.

PAIN OF IRRITATION.

In the extensive experiments of Cannon, Pavlov and Hertz and the masterful volume of MacKenzie (*Symptoms and Their Interpretation*), it has been thoroughly established that organs which do not contain non-striated muscle fiber are incapable of inherent sense of pain and it is not until their capsule or surrounding tissues become involved or impinged upon that they transmit a pain symptom. Those structures or organs, however, that contain non-striated muscle fibers are capable of evincing pain when their muscular function is deranged. For example, extensive

changes in the liver are devoid of sensation, as in extensive cirrhosis, and extensive disease of the kidneys is symptomless, as to pain, until the capsule is impinged upon. The stomach and intestines, on the contrary, will transmit undoubted evidence of inherent distress when overstretched or otherwise disturbed in their normal motor function.

In the main, however, pain must be interpreted through reflex manifestations in the periphera. Let us follow MacKenzie over the route of a reflex impulse. An irritation within the abdomen is transferred by the afferent autonomic nerves to one or all of the three types of efferent nerve centers, that is viscero-sensory, viscero-motor or viscero-secretory. The interpretation of the impulse is considered and transferred to the efferent branches for action at their peripheral distribution and results in these nerves carrying out their specific functions of hypersecretion, hypermotility or hypersensibility (pain), or all three.

Reflex or referred pain finds its simplest demonstration in a violation of the "law of the intestine", called by Meltzer, the "law of contrary innervation," which states that in a tube containing non-striated muscle fibre, contraction is followed by relaxation above the point of contraction. Violation of this law causes a sense of distress; for example, closure of the pylorus is coincident with relaxation of the ilio-cecal valve but stimulation of the pylorus causes closure of the ilio-cecal valve and, contrarily, the introduction of irritants into the cecum causes spasm of the pylorus.

One additional point of diagnostic value, dependent upon this "law of the intestine" is that irritation of a non-striated muscle tube causes exaggeration of the normal function of that tube above the point of irritation and cessation below, as exemplified in the hypermotility and hypersecretion in the first stages of appendicitis.

All of these factors are consistant with Nature's desire to remove an offending object by exaggerated function, hypermotility, hypersecretion and hypertonicity.

PAIN OF INFLAMMATION.

The second phase of pain is concerned with inflammation and its product, inflammatory exudate. The primary object of inflammation is dissemination of its products beyond the point of inception and it chooses, by physical law, the line of least resistance so that it remains merely irritative until the natural channel for its drainage is occluded, when it selects the next best without consideration of anatomical barriers. Therefore, confined products of inflammation will permeate through muscular layer and capsule to find an outlet, soon reaching the peritoneal covering of the affected part either by perforation through the part or dissemination upon its surface.

The peritoneum represents an area greater than that of the skin. Its ability to absorb increases, from below up, in direct proportion to the preperitoneal sensibility that is absorption and sensibility in the pelvis are slight, increasing until they reach their maximum at the diaphragm. Peritoneal irritation has its pain interpretive area in three structures, the peritoneal layer of the parietal peritoneum, the voluntary muscles and skin, all of which are supplied with afferent and efferent nerve endings. An impulse is carried from the peritoneum to its interpreting centers by the autonomic nerves, transferred to the efferent sensory nerves of the preperitoneal layer to be interpreted in the part immediately surrounding the inflammation as localized tenderness and to the motor and sensory nerves supplying the muscles and skin, to be distributed to their filamentary endings over a more disseminated area, thus accounting for and represented by muscular rigidity and hypersensibility of the skin and in the main affecting the parts contiguous to the point of peritoneal irritation.

Therefore with the involvement of the peritoneum by inflammatory exudate, the whole picture changes. Nature's endeavor to remove the offending element by making use of the violations of the "law of average localization," "the law of the intestine", hyperactivity and exaggeration of normal function, changes to one of segregation and limitation, all hyperactivity ceases, the pain is localized in the area of or the part intimately related to the inflammation and there is immobility and cessation of the three 'hypers', Nature's entire armament is directed toward localization and protection of the offending part. The muscles of the area become rigid and the pain changes to a localized tenderness, with anxiety rather than acute distress, and agglutination of the injured peritoneum attempts to wall off the irritated area.

To recapitulate, the pain of irritation is one of colicky character, intermittent, disseminated, at-

tended by hypermotility and hyperactivity, not only of the part affected but of the subject as well, the patient moving around, exerting pressure over the abdomen and complaining of the discomfort; in contradistinction to the pain of inflammatory exudate, which is of a constant localized character with immobility, rigidity and cessation of activity, not only of the part affected but of the subject as well, the patient lying down, anxiously and rigidly protecting the affected part from outward pressure, not complaining of the pain, per se, although the slightest external vibration will elicit complaint.

By virtue of understanding the fundamentals of the production of pain and the usual distribution of this symptom, it is possible, with a fair degree of accuracy, to assign pain to a specific organ or structure, however, the coincidence of secondary or confusing conditions make the exact diagnosis extremely difficult.

According to Heyd, 18% of all cases coming to laparotomy have two lesions, either of which is an operative indication. One needs but to mention the coincidence of 69% of disease of the gall-bladder accompanied by appendices showing pathological change, 66% of duodenal ulcer showing disease of the appendix, 81% of pancreatitis showing pathological change in the biliary tract, 22% of duodenal ulcer having gall-bladder disease. So it becomes our duty to correlate symptoms with pathology plus secondary complications.

It is estimated that, with the exception of the female pelvis, 95% of all surgical conditions of the abdomen are concerned with gastro-duodenal ulceration, disease of the biliary tract and pancreatitis, and disease of the appendix, therefore it devolves upon the diagnostician to differentiate these conditions and a small percentage represented by neoplasm, ordinarily, to cover the field of necessary diagnosis.

RIGHT UPPER QUADRANT.

Let us consider the application of these principles of pain interpretation in some of the more common surgical disease. In the right upper quadrant, the intimate anatomic relationship accounts, by coordination of function, and in part by continuity, for the symptomatic relationship in this region.

STOMACH.

The stomach is aptly termed the mouthpiece of the upper abdomen and yet its principal symptom, indigestion or dyspepsia, finds its causative factor in 40% of cases outside the abdomen, e. g., tuberculosis, heart disease, eye strain, neurosis, etc., and 40% within the abdomen but outside the stomach, such as gall-bladder disease, appendicitis, pancreatitis, etc., and only 20% of cases represent actual disease of the stomach itself. It is a sad commentary on diagnosis that 10% of all tabetics are operated upon for abdominal pain.

Gastro-duodenal ulceration occurs, with a few exceptions, at three points, along the lesser curvature or saddle, (1) close to the cardiac or esophageal opening, (2) close to, or impinging upon, the pylorus and (3) just beyond the pylorus in the duodenum on its anterior superior surface. The pain reflex of gastro-duodenal ulceration is characterized by three symptoms, pain, with a definite relationship to the intake of food, periodicity and chronicity, that is to say, a patient suffering from one or the other types of ulceration will portray the pain syndrome, in (1) precisely the same way, with exactly the same relationship to the intake of certain articles of food, accompanied by the three "hypers"—hypermotility, hypersecretion and hypertonicity, (2) the periodic recurrence of these symptoms, day after day, during the period of activity of the condition and (3) a chronic character.

In the first type of ulcer, near the cardiac opening, pain comes on shortly after the ingestion of food. The patient suffers from undernourishment, because of the hypermotility, vomiting occurs soon after the ingestion of food without the possibility of its digestion or assimilation. The second type, that occurring close to the pylorus, is characterized by a later time development of symptoms. Pain is of the same character as to time relationship, periodicity and chronicity, but the ulcer, by its position, causes mechanical disarrangement of the pyloric function or impingement upon its lumen. The food has become partly digested but its regular injection into the duodenum is interfered with, therefore late vomiting of partly digested and putrefied material, the patient suffering from toxic absorption and anemia. As in gastric ulcer, duodenal ulcer manifests its pain with a time relativity, periodicity. The pain, coming late, after the completion of gastric digestion, is the characteristic hunger pain, relieved by the ingestion of food or an alkali, the patient is well nourished, vomiting is rare.

Let us superimpose upon this picture a time

when the cycle and sequence of symptoms change. The pain becomes less pronounced, is dull, constant, the hyperactivity and hypersecretion are reduced or absent: the characteristic primary symptom-complex of malignant change is superimposed upon ulceration. It has been lately stated, from the Mayo Clinic, that all ulcerations of the stomach measuring 2½ cm. in diameter are strongly suspicious, if not already carcinomatous in character.

BILIARY TRACT.

The coincidence of gall-bladder disease and gastro-duodenal ulceration is explainable by continuity so that the perfect cycle of gastric symptoms referable to ulceration may be clouded by the complication of disease of the biliary tract in about 22% of cases.

The causative factor in biliary disease is infection. Depending upon the virulence or degree of this infection, there is inflammatory reaction in the wall of the gall-bladder itself or the precipitation of bile salts surrounding the clumped bacteria, forming calculi. Therefore we have as our first indication of gall-bladder disease disturbed function, hypermotility, hypersecretion and hypertonicity above the foramen of Pater, that is, indigestion, without definite relation to the intake of food, gaseous eructations and epigastric discomfort.

Tenderness, as a rule, may be elicited by deep pressure over the gall-bladder giving the characteristic inspiratory "hitch", explained by manual impingement upon the capsule (peritoneal covering) of the diseased organ.

At some period in the history of this case is inserted a sudden pain, sharp, shooting, lancinating, accompanied by vomiting and controlled only by opiates, lasting for a variable time and disappearing as suddenly as it began—a perfect picture of exaggerated hypermotility, hypersecretion and hypertonicity—nature's endeavor to remove an obstructing object, viz., calculus obstructing the cystic duct.

Let this calculus enter the common duct and there is a repetition of the sudden onset of pain and vomiting, as indicated for obstruction of the cystic duct and, in addition, jaundice and church steeple temperature, formerly called intermittent hepatic fever, followed by sudden cessation of pain and disappearance of all symptoms within twenty-four hours.

PANCREAS.

That pancreatitis occurs more frequently than symptomatology referred to it would indicate is undoubtedly true. Its occurrence may explain many vague conditions referred to as stomachic and biliary disturbances. The close anatomic association of the pancreas to the common bile duct (the common duct running through the substance of the gland in 67% of cases and being posterior to it in 32%, and having a common reservoir and outlet in the duodenum) accounts for the great percentage of coincidence of pancreatitis with biliary infection and yet there is no doubt of the numerical relation of gastro-duodenal ulceration and pancreatitis. Acute hemorrhagic pancreatitis, expressively termed pancreatic apoplexy, may find its cause in obstruction of the ampulla of Vater. (Opie's famous case is illustrative of this fact.) Reflux from the duodenum and irritation of infection conveyed to the gland through its complicated blood supply or lymphatics has been a demonstrated cause of this condition. It is seldom until this terrifying condition occurs that we realize the awful potentialities of this gland. Agonizing, generalized abdominal pain, intractible and uncontrollable vomiting, anxiety, cyanosis—a most terrifying picture—the whole gut tube above the large intestine engaging in a chaotic spasm of hyperactivity.

The clinical picture is so extreme that a diagnosis is seldom made before operation or autopsy. Morrison states that "if the history, symptoms and signs do not exactly fit acute intestinal obstruction, or stomach or duodenal perforation, perforated appendix or acute cholecystitis, and yet have some resemblance to each of them, pancreatitis is the most probable cause." This is explained by the anatomical position of the pancreas, lying as it does retroperitoneally, in direct continuity to the solar plexus, so that all the efferent impulses of this center are set into a violent chaotic commotion.

Malignancy of the pancreas, as is the characteristic of abdominal malignancy, is symptomless, until made known by its complications. It occurs most frequently in the area of pancreatic inflammation, that triangular section between the ducts of Wirsung and Santorini, and by its insidious development gradually impinges upon the lumen of the common duct, when progressive icterus develops and continues to the end.

It is probable that no case of biliary infection occurs without some pathological change in the liver itself. The intimate lymphatic relationship

and pathological findings seem to corroborate this statement. It is symptomless, however, unless involvement of its capsule occurs.

APPENDIX.

The sequence of symptoms in appendicitis follows very exactly the theories of irritative and exudative pain production. In the first phase there is irritation within a non-striped muscle tube, colic, hypermotility, vomiting, hypersecretion, hyperactivity and constipation. The second phase, representing the time when inflammatory exudate has reached the peritoneum, is characterized by pain confined to the right lower quadrant, tenderness in the right lower quadrant, muscular rigidity and anxiety. In the third phase, where inflammatory exudate has attacked a larger area of peritoneum, there are increased muscular rigidity, peritoneal adhesions striving to wall off the inflamed area and the presence of a palpable tumor.

Because of the loose attachment of the appendix, it is capable of occupying many positions, bringing it into relationship with other structures, which by extension of the inflammatory process, may confuse the symptomatology. With the appendix lying over the brim of the pelvis it comes in direct relationship to the right ureter, so that, not infrequently there is the characteristic pain of ureteritis, radiating downward to the thigh and testicle, masking the true condition. With the nondescent, or imperfect descent of the cecum, the appendix may be arrested under the border of the liver and when attacked by inflammatory process gives rise to confusing signs in the right upper quadrant. The retrocecal appendix not infrequently rests its tip in the right kidney fossa and extension of irritation and inflammation by continuity gives symptoms of calculus in the pelvis of the kidney. These are but a few of the vagaries possible in the appendix, but in the main its symptomatology is as exact as that of gastric ulcer.

It is evident, therefore, that abdominal pain is constant in its expression, deviating but slightly from the law of innervation and reflex. The careful application of the fundamental principals of pain production and interpretation will lead to better sifting and assignment of pain, as accessory to other clinical manifestations, in the diagnosis of disease.

CONCLUSIONS.

1. Embryology of the midline development accounts for the midline character of reflex pain.

2. Abdominal pain is of two classes, (1) the pain of irritation causing deranged function and (2) the pain of inflammatory exudate, causing suspended function.

3. Pain impulse is absent in organs containing no muscle fiber, present in those containing non-striated muscle fiber, when balance between contraction and relaxation is disturbed.

4. Pain of irritation is characterized by hypermotility, hypersecretion and hypertonicity.

5. Pain of inflammatory exudate is characterized by segregation, localization, spasticity and permeation of anatomical barriers.

6. Confusion of symptomatology is principally caused by coincidence of two or more conditions.

7. Gastro-duodenal ulceration is characterized by pain with a definite relationship to the intake of food, periodicity and chronicity, the time interval depending upon the position of the ulcer.

8. Biliary disease of infective origin is divided into three phases, (1) when confined to the gall-bladder, giving reflex gastric symptoms, (2) colic, when in the cystic duct and (3) colic plus jaundice plus fever, when in the common duct.

9. Pancreatitis is probably a frequent condition causing reflex biliary and gastro-intestinal disturbances. The symptomatology of acute hemorrhagic pancreatitis is caused by activation of its secretions and impingement upon the solar plexus.

10. Appendicitis in the first stage, an irritation within a non-striated muscle tube, is characterized by the three "hypers" above the point of irritation, in the second stage, by localized tenderness, rigidity and a cessation of the three "hypers." Because of its mobility the appendix is prone to cause conflicting symptoms by extension of irritation to ureter, right upper quadrant, kidney, etc.

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ENLARGEMENT OF THE THYROID GLAND.

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Although perversions in the functions of the thyroid are met with apart from any visible alteration in the size of the gland, e. g., myxedema, by far the greater number are associated with its enlargement. Even deficiency conditions such as myxedema occur in conjunction with certain types of goiter and it is well known that cretins may possess enormous goiters.

It is proposed therefore to briefly review the types of goiter and their treatment. A correct diagnosis of the type of thyroid disease one is dealing with is necessary for efficient treatment, and it is only too often that a goiter is summarily dealt with as such and the treatment as easily disposed of. To cite one instance, hyperthyroidism is unfortunately regarded by some people as a synonym for Graves' disease, yet it is surely as illogical to term all types of hyperthyroidism Graves' disease as to call all cases of albuminuria Bright's disease.

We have to deal, clinically, with enlargements of the thyroid gland of three types,—those associated with symptoms of thyroid deficiency, those unproductive of symptoms and those producing hyperthyroidism or, to use the better term introduced by the Berne School, thyrotoxicosis; pathologically with two varieties, those arising from an alteration in the vesicular tissue of the gland, e. g., endemic goiter and Graves' disease, and those arising from the interstitial tissue, e. g., the adenomata.

Each of these two pathological types is classifiable into one or other of the clinical groups according to the presence or absence of associated symptoms.

Gross deviations from normal thyroid activity have long been recognized in the direction both of insufficiency and of thyroid intoxication. Both cretinism and exophthalmic goiter were recognized as definite clinical entities as early as 1835. Between that year and 1840, Graves, Parry and Basedow had all drawn attention to the disease named after them. In 1859 Schiff pointed out that complete extirpation of the thyroid body in dogs resulted in their death, and in 1873 Sir William Gull of Guy's described a condition occurring in women after the menopause and later named myxedema by Owen of St. Thomas'. Following operation on some of his earlier cases Kocher described operative myxedema (cachexia strumipriva) in the year 1882. Since that time other conditions have been recognized and unfortunately such clumsy expressions as "Basedowified goiter," etc., introduced to classify them.

While the gross thyroid perversions are readily distinguishable, e. g., the typical case of myxedema or Graves' disease, lesser deviations from the normal are not so easily recognized, and here the basal metabolic index is of value or the epinephrin hypersensitive test introduced by Goetsch of Brooklyn. The latter observer has also demonstrated that it is now possible to recognize histologically the degree of thyroid activity by the relative abundance of eosinophile granules (mitochondria) in the thyroid cells and thus to allocate a special pathological anatomy to those goiters that produce thyrotoxicosis.

Dealing, then, with the two pathological divisions into which we place goiters according to their origin from vesicular tissue, and remembering always that each type of goiter in each of these divisions may either be associated with or unproductive of symptoms in the patient, and thus belong to one or other of the three clinical varieties that we have mentioned, we shall consider first those thyroid enlargements dependent on alteration in the vesicular tissue.

These include:

1. *Puberty Goiter.* Under conditions producing physiological stress, e. g., at puberty or during pregnancy the thyroid tends to hypertrophy.

Diffuse enlargement due to vesicular hypertrophy is common in young girls at puberty, and although this occurs very freuently at the present time it has apparently done so for many years. Most of the pictures of young girls, painted by Greuze about 1750 show puberty goiters.

In the majority of cases of puberty goiter the enlargement is transitory, disappearing with the approach of adolescence, but sometimes a puberty goiter persists and may give rise to hyperthyroidism. Even exophthalmic goiter may arise from a persistent puberty goiter.

Mild cases of hyperthyroidism arising in persistent puberty goiters constitute the bulk of those cases termed 'formes frustes" by the Continental writers.

2. *Simple, parenchymatous, colloid or endemic goiter,* (e. g., "Derbyshire neck") is an enlargement

due to vesicular hypertrophy. McCarrison has pointed out that "it is a deficiency disease due to an insufficient supply of iodine for the needs of the thyroid gland or, more properly, for the needs of the body cells in the form of the gland's iodine-containing hormone" (according to Kendall tri-iodo-tryptophane). Hypertrophy is induced by the relative insufficiency of iodine. This may arise from a variety of causes dependent upon deficient ingestion of the halogen or over demand for it by the body cells under conditions of physiological stress.

The distribution of parenchymatous goiter is worldwide. It is endemic in Derbyshire, in the Swiss valleys from which Kocher collected his early cases, in the Gilgit Highlands in India where McCarrison's important work on the etiology was carried out, in the vicinity of certain goiter wells in Germany (Kropfbrunnen), in Khokland, Turkestan, around Christchurch in the South Island of New Zealand and elsewhere.

3. *Graves' Disease* demands for its recognition the three cardinal signs of exophthalmos, tachycardia and goiter. In common with all types of thyrotoxicosis other well-known signs occur, vasomotor disturbances, (subjects of hyperthyroidism feel the heat, myxedemics and cretins feel the cold), increased peristalsis, loss of weight, mental excitability and tremors.

Exophthalmic goiter may be of a primary or a secondary type. Its onset is sometimes abrupt, following a nervous shock, but more often insiduous. The secondary type develops in a patient with goiter, frequently of the puberty type, less often of the endemic variety and it has been shown that where goiter is endemic Graves' disease is rare. Secondary Graves' disease may occur in a previously quiescent adenoma but non-exophthalmic thyrotoxicosis is a more common complication.

In the goiter of primary Graves' disease we have another instance of a thyroid enlargement arising from the vesicular tissue of the gland, but the well known pathological picture of intravesicular proliferation at the expense of the colloid material which is diminished to such an extent that the gland appears almost solid, is the converse of that seen in parenchymatous goiter where the vesicular epithelium is flattened out by the increase of colloid in the distended vesicles.

While the enlargements of the thyroid gland that arise from its vesicular tissue, e. g., puberty goiter, endemic goiter and Graves' disease, are symmetrical, the gland being affected as a whole, those which originate in the interstitial tissue are often of an irregular outline.

The interstitial enlargements comprise:—

1. *The adenomata* which apparently arise in accordance with the Cohnheim view of the origin of tumors from "fetal rests". In the case of the thyroid, the latter appear to be the so-called fetal interstitial cells described by Wölfler in 1883.

Adenomata are benign tumors, encapsuled, and so easily enucleated from the surrounding thyroid tissue. At one time they were classified as fetal and cystic (bronchoceles). It was pointed out by James Berry, however, that as the solid tumors increased in size their vesicles coalesce, the septa gradually disappear and cysts are produced, and thus the distinction depends solely upon the age of the adenomata themselves.

While single examples are met with, these bodies are frequently multiple. They vary in size from a pin's head to enormous dimensions. Bruns removed a bronchocele as large as a football from a woman of 58 who was in the habit of resting it upon a table when she sat down; the goiter reached as low as the umbilicus and produced cervical lordosis.

These tumors may be associated with hyperthyroidism, may be unproductive of symptoms or may give rise to thyrotoxicosis. The toxic adenomata constitute some of the most satisfactory cases of hyperthyroidism to treat surgically, the results of their extirpation being most gratifying.

2. *Diffuse adenomatosis.* Under this heading Emil Goetsch has recently described cases clinically resembling pulmonary tuberculosis but dependent upon a diffuse proliferation of the interstitial tissue of the thyroid. The gland is but little enlarged but hyperactive, the metabolic rate is increased and this condition is another example of hyperthyroidism. The pathological picture is analogous to that of the kidney in chronic interstitial nephritis or perhaps a better parallel would be the uterine mucosa in chronic endometritis.

It is not proposed to dwell here upon rare conditions like hydatid cysts, nor with that curious condition termed general thyroid malignancy in which metastases of the same structure

as the thyroid gland appear in bones particularly the skull, femur, clavicle, sternum, humerus and vertebrae.

Both carcinoma and sarcoma occur in the gland and are said to arise more commonly in thyroids that are goitrous and thus be more prevalent in regions where goiter is endemic than elsewhere. The infrequency with which carcinoma of the thyroid gland disseminates is an interesting feature.

Pain, hardness and fixity of the enlarged thyroid, changes in the voice due to infiltration of the recurrent nerves, thrombosis of the thyroid and jugular veins and increasing dyspnea due to involvement of the trachea, are all grave signs of malignant disease of the thyroid.

We have briefly touched upon the commoner types of enlargement of the thyroid gland.

When confronted with a goiter case one has to consider its type, whether it is producing symptoms or not, and finally whether it requires treatment for either its local or general effects.

The indications for treatment of thyroid enlargements may be summarized as:—

(a) Local mechanical effects, e. g., compression of the trachea particularly seen in cases of substernal goiter.

(b) Deformity, i. e., to improve the patient's appearance.

(c) Hyperthyroidism, to reduce the degree of which in order to relieve symptoms and also to prevent those visceral changes, e. g., myocarditis, which are the result of prolonged thyroid intoxication.

Treatment is either medical or surgical. The former comprises the administration of iodine and its compounds, of thyroid extract itself, and of certain drugs for the symptoms produced by hyperthyroidism.

Iodine is indicated in those cases of vesicular enlargement which are instances of compensatory hypertrophy at a time of stress throughout the endocrine system, e. g., puberty goiter, but it should be mentioned here that puberty goiter is so common that it would appear that the enlargement is a physiological response. Probably every thyroid gland hypertrophies to a certain extent at this time. As has been mentioned the condition in the great majority of cases is transient and then requires no treatment. Iodine is indicated in endemic goiter and McCarrison has shown also how valuable intestinal antiseptics, e. g., thymol, can be.

Thyroid extract may be given in place of iodine and is particularly indicated in the face of deficiency symptoms. Both iodine and thyroid extract are useless for the treatment of adenomata except to relieve symptoms where these tumors are associated with hypothyroidism, and are contraindicated in all cases of thyrotoxicosis. As Murray has said, thyroid simply "adds fuel to the fire".

Iodine probably acts by promoting saturation of fatty acids with a consequent increase in autolysis in the thyroid dependent upon removal of the inhibitory effect which the unsaturated acids exert. While iodine itself and potassium iodide are useful, it would appear that the organic compounds are preferable. Iodoform (CHI_3) in the form of a pill of ½ to 3 grains with glucose is useful.

At the present time the medical treatment of hyperthyroidism is unfortunately but symptomatic. From time to time certain drugs have been recommended, quinine hydrobromate being one of the most recent, but the mere number of the drugs advised is sufficient to condemn the medical treatment except for particular symptoms, e. g., mental unrest, heart failure, diarrhea, etc. Undoubtedly the object to be aimed at, however, should be the reduction of the degree of hyperthyroidism in the early stages, and although it should be remembered that this sometimes occurs spontaneously, in the great majority of cases surgical treatment alone offers a prompt and reliable means of checking it. While it must be admitted that the risk is often great, especially in severe cases of Graves' disease, and the result sometimes uncertain, the great advantages of the surgical treatment of hyperthyroidism are the saving of time by its rapid reduction and relief of symptoms, the consequent diminution of the risk of myocardial degeneration through prolonged exposure to the thyrotoxicosis, and the complete and rapid recovery that occurs in many cases.

Enucleation of toxic adenomata produces most gratifying results. Partial resection is the ideal procedure in hyperthyroidism arising in parenchymatous enlargements. This applies to Graves' disease, but owing to the condition of the patient is often not permissible as a primary procedure. In these severe cases the intoxica-

tion must be reduced by stages; this is effected by preliminary ligation of the thyroid vessels.

It is not proposed to go more fully into the surgical treatment of hyperthyroidism here. This has been done elsewhere.*

The disadvantages of *x*-ray treatment are (1) the dose required to produce an effect is at best a guess, e. g., myxedema has been produced. (2) Relapses are common. (3) Delay in the shape of failures leads to serious visceral damage, e. g., of the myocardium, nervous system, and liver. (4) Scar tissue and adhesions are a handicap if operative treatment is undertaken later.

Surgical treatment for simple goiter is necessary where dangerous pressure symptoms are produced, and is at times required to improve the appearance of the subject of an old standing goiter which is intractable to treatment with iodine or thyroid extract.

In conclusion, it is hoped that this brief review may be useful, as only by making in the first place an accurate diagnosis of the type of thyroid disease one is dealing with, by carefully considering whether treatment is indicated and if so along what lines, and by the prompt institution of the treatment may many of those arbitrary and illogical measures so often detrimental to the patient's interest, be avoided.

The prompt treatment of acute hyperthyroidism introduces one more preventive policy in these days of preventive medicine. That prevention is better than cure can nowhere be better exemplified than as applied to thyrotoxicosis, for we must bear in mind that once myocardial degeneration has developed its cure is impossible.

SUMMARY

1. Almost all thyroid perversions, even in direction of deficiency, are associated with enlargement of the gland.
2. Goiters:
   - (a) clinically of three types
     - i. associated with hyperthyroidism
     - ii. not producing symptoms
     - iii. thyrotoxic
   - (b) pathologically of two types
     - i. vesicular enlargements.
     - ii. interstitial enlargements.
3. Types of vesicular hypertrophy.
   - (a) Puberty goiter.
   - (b) Endemic goiter.
   - (c) Graves' disease.
4. Types of interstitial hypertrophy.
   - (a) Adenomata.
   - (b) Diffuse adenomatosis (Goetsch)
5. Indications for treatment of a goiter.
   - i. Pressure symptoms.
   - ii. For appearance.
   - iii. Thyrotoxicosis.
6. Iodine or thyroid extract indicated, perhaps in puberty goiter, certainly in the endemic disease for which intestinal antiseptics are also useful.
7. Surgical treatment necessary where these measures are not effective or in hyperthyroidism in which the ideal procedure is partial resection; in bad cases preceded by ligation of arteries.
8. Other treatment of hyperthyroidism. Drugs unfortunately useless except to allay particular symptoms.

   Disadvantages of *x-rays*:
   - i. dosage only guess-work.
   - ii. uncertain results.
   - iii. time lost during which cardio-vascular degeneration is occurring.
   - iv. formation of fibrotic tissue, which hinders surgical treatment if necessary later.
9. Plea for prompt treatment of hyperthyroidism.

The author is deeply indebted to Dr. Strickland Goodall and to Dr. James Berry for much valuable advice and for their kind permission to use much of the clinical material upon which this paper is based.

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HERNIAS IN CHILDREN. A NEW TECHNIC FOR THE RADICAL CURE OF INGUINAL HERNIA.*

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At what age should children with hernia be operated upon? General rules will not solve this problem satisfactorily, because each of the little patients must be considered individually; however, early operation should be advised in all cases in which an expectant treatment has not cured or at least greatly improved the condition at the time that the child begins to romp about. Indeed, strangulation is the main danger of all hernias and it occurs practically always during so-called unruly exertions. Is anybody more prone to unruly exertions than a lively, healthy child? By operating early, therefore, we will not only prevent the inherent danger of strangulation, but we can obtain a radical cure more easily and allow the little patient to lead safely his normally active life. By following this rule the surgeon can easily and logically decide when to operate in each case. Let us consider two extreme cases: first, a child undeveloped, apathetic, undernourished, with poorly developed musculature; second, a child well built, full of life and mischief. It is self-evident that operation in child number one should be delayed until his general health has improved, his tissues have become firm and strong: following this general improvement, his hernia might be cured spontaneously. On the contrary, in child number two, we have to deal with a subject whose tissues are firm, strong; whose general health is excellent, but who has a defect in his abdominal wall. Why wait to repair it? In child number one, the repair might not hold because done on poor tissues, while in child number two the repair will not only hold, but the earlier it is done, the less the changes undergone by the tissue and the more ideal the final results. Moreover, if in child number one the danger of strangulation is remote, in child number two the danger is always present and in order to prevent it, a truss is worn. The truss, however, has many drawbacks; it is not

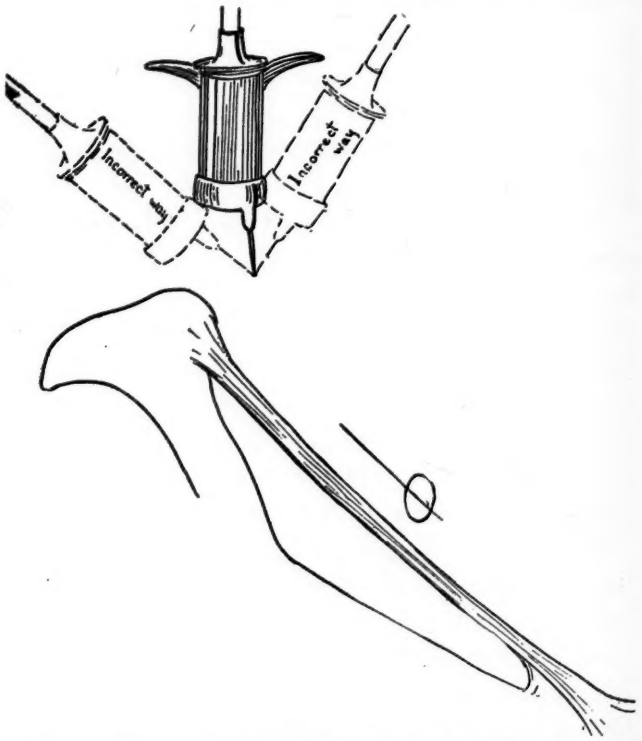

Fig. 1. Shows correct manner of injecting solution and location of internal ring, direction, position and length of incision.

an absolutely sure preventive; it injures, more or less, the tissues on which the repair is to be done later, consequently weakening the repair itself; it does not allow the full enjoyment of physical exercise to which a healthy child is entitled in order to develop normally.

Special mention is to be made of epigastric and umbilical hernias. Epigastric hernias should be operated upon as early as diagnosed, because a spontaneous cure is not to be expected: adhesions between the parietal peritoneum and abdominal organs will form if the operation is delayed, and often they cause a great deal of unnecessary suffering. Umbilical hernias should also be operated upon early, specially when the sufferer is a girl. We know that all human beings are born with a potential umbilical hernia. However, in most cases, immediately after birth, the tissues about the umbilicus adhere so firm-

*Read before the Section of Pediatrics, New York Academy of Medicine, February 8, 1923.

ly that hernia at the umbilicus occurs, but in comparatively few cases. When the tissues do not adhere firmly, immediately after birth, an umbilical hernia is formed. In many cases a spontaneous cure takes place in the early months of life: when, however, this does not happen a more or less suitable truss is applied and often a cure ensues. I wish to make a plea against prolonged attempts to obtain a cure by the application of a truss, because the union of the tissues which occurs later in life is not very firm, and this fact assumes great importance when girls are concerned. The abdomen of the woman must, of necessity, undergo a great amount of strain during pregnancy and if the tissues around the umbilicus are not firmly adherent they easily

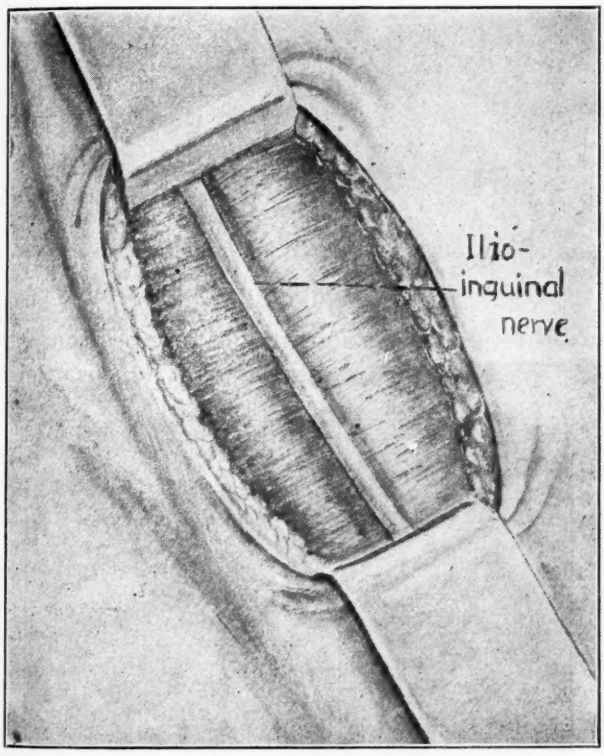

Fig. 2. Separation of the fibers of the internal oblique, showing the ilio-inguinal nerve.

give way and the formation of an umbilical hernia follows, which at times is made serious by unpleasant complications. The plea for early operation in umbilical hernia is made to obviate later operation, which is more serious, less effective and might be preceded and followed by more or less severe complications.

The plea for early operation in cases of children with hernia is that the operation is more successful the earlier it is done, as naturally tissues have undergone fewer changes and tissue repair is at its optimum early in life, and the operation is practically without danger, the little patient not even running the risk of general anesthesia, because local or spinal analgesia is ideal in children.

In regard to inguinal hernia, I shall speak here only of the indirect variety, which is the one most frequently met, and present a new technic for its operation. The modus operandi is the following: general anesthesia can be dispensed with as local anesthesia is not only safe, but of easy application. The anesthetizing solution (novocaine, 1 to 200) is injected at a point 2 cm. internal or mediad to the anterior superior iliac spine. Between 20 and 30 cc. of solution are necessary. The needle must be introduced, as shown in figure 1, perpendicular to the abdominal wall and it must penetrate down to the space between the internal oblique and transversalis muscles. At this point the needle will usually strike the ilio-inguinal nerve. Anesthesia is complete in

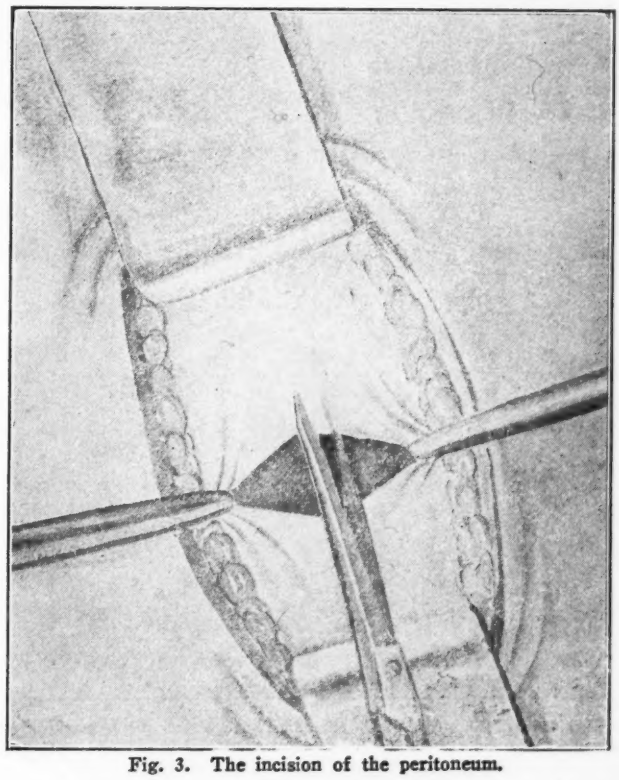

Fig. 3. The incision of the peritoneum.

about five to seven minutes, but not before this time, therefore incision should be started only after from five to seven minutes have elapsed.

The internal ring, which lies 1 cm. mediad to the Poupart's ligament and to a point midway between the anterior superior iliac spine and the spine of the pubis, is located first and the incision is started at about 2 or 3 cm. lateral to the internal ring (figure 1) and carried down to it through skin, fat, fascia and the aponeurosis of the external oblique, which is also divided in the same direction and for the same length.

The fibers of the internal oblique, running in a transverse and slightly downward direction, present themselves and are separated by blunt dissection at

a point about 1 cm. above the internal ring. Blunt retractors keep the fibers separated (figure 2). The ilio-inguinal nerve is seen lying about the middle of the incision and is pushed gently aside after a few drops of anesthetizing solution are injected into it. The fibers of the transversalis are then also separated by blunt dissection and kept so with blunt retractors, exposing the transversalis fascia and peritoneum. (Note: The preperitoneal fat lying between these two layers is at times extremely thick and often mistaken for omentum.)

The peritoneum is raised up and cut open between two forceps (figure 3), and the incision is continued toward the internal ring, until the peritoneal opening of the sac presents itself at the internal ring (figure

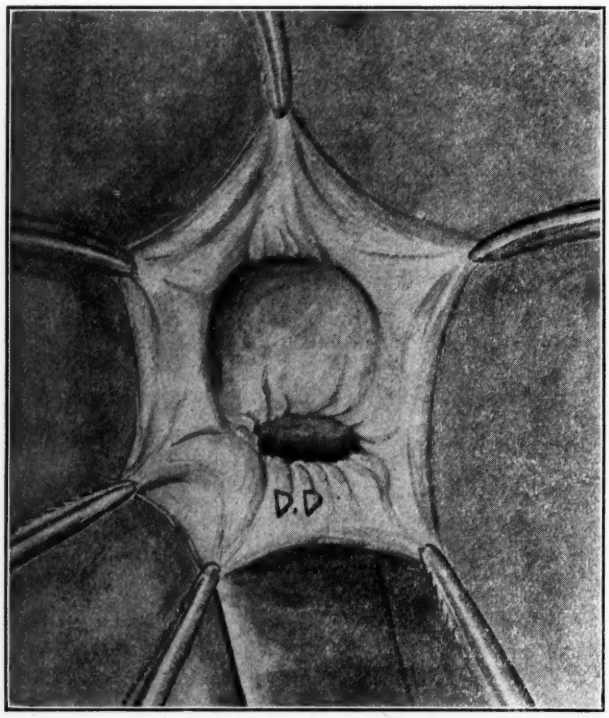

Fig. 4. D. D., dimpled depression of peritoneum, marking the origin of the sac.

4). It has a sharply dimpled appearance that cannot be mistaken for anything else, once it has been seen, and, approached from the abdominal cavity, at this point is extremely superficial. The peritoneum is secured with forceps and in order to ease the dissection of the sac at its neck *two different types of forceps* are applied in the following manner (figures 5 and 6): Around the ring are placed, for instance, straight forceps and above are placed curved forceps. The peritoneum, forming the peritoneal opening of the sac, is dissected away by passing a blunt blade of scissors under the peritoneum itself above the opening, the blade of scissors separates the peritoneum from the transversalis fascia, so that only the peritoneum is severed, and we proceed to cut the sac free from the peritoneum at the internal ring from the inside of the peritoneal cavity. While the incision of the peritoneum is progressing, the cut edges are caught with forceps of different types,

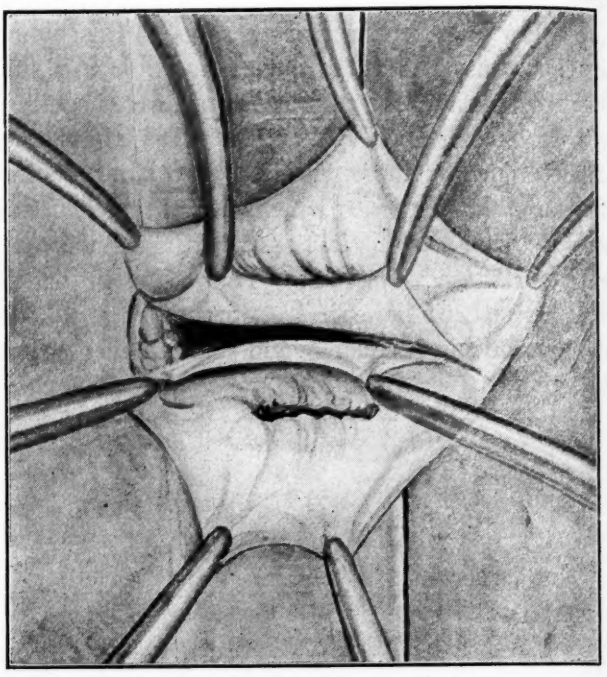

Fig. 5. Dissection of sac from general peritoneum.

curved forceps above and straight forceps around the sac. We have, then, two groups of forceps, and by

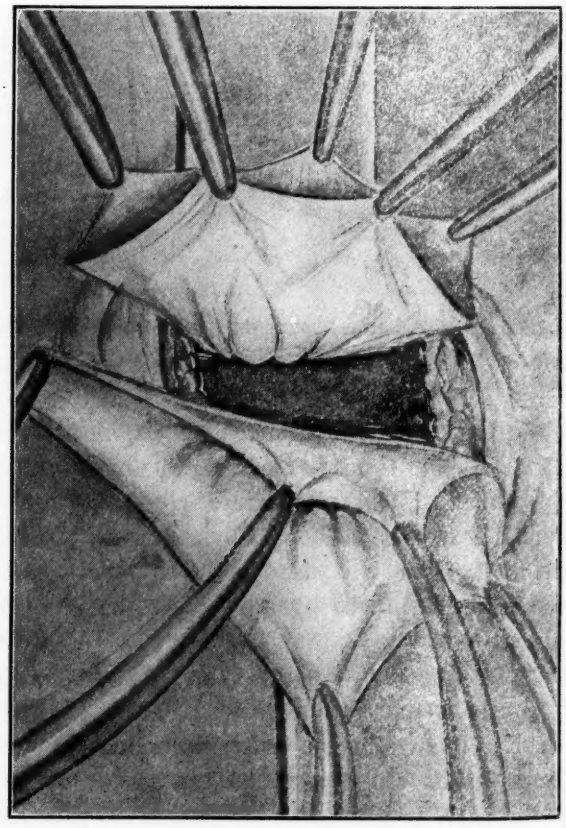

Fig. 6. Blunt separation of sac from general peritoneum.

holding one group in each hand (figure 6) we can separate the neck of the sac from the peritoneum

above it and from the underlying tissues. This separation, done bluntly, is continued until the peritoneum above (held by the curved forceps) is completely free and can be sutured easily (figures 7 and 8).

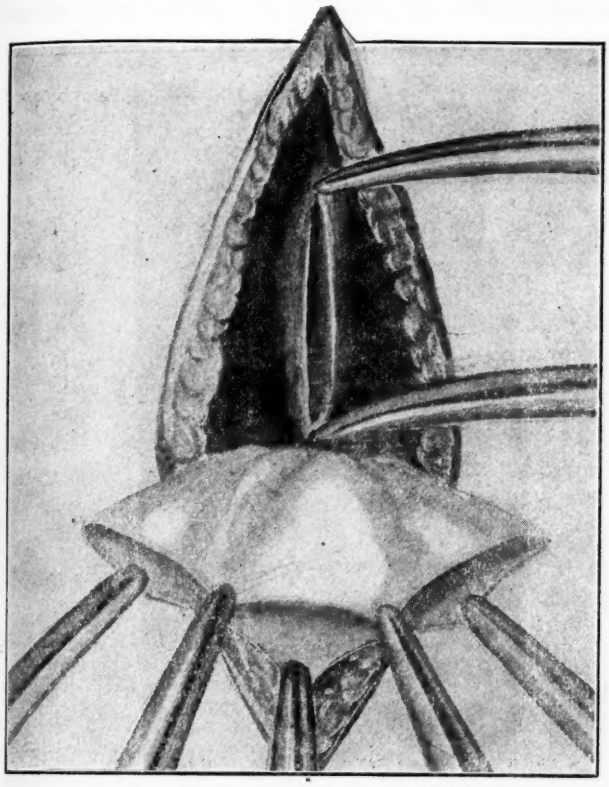

Fig. 7. Peritoneum and sac completely separated. Peritoneum ready to be sutured.

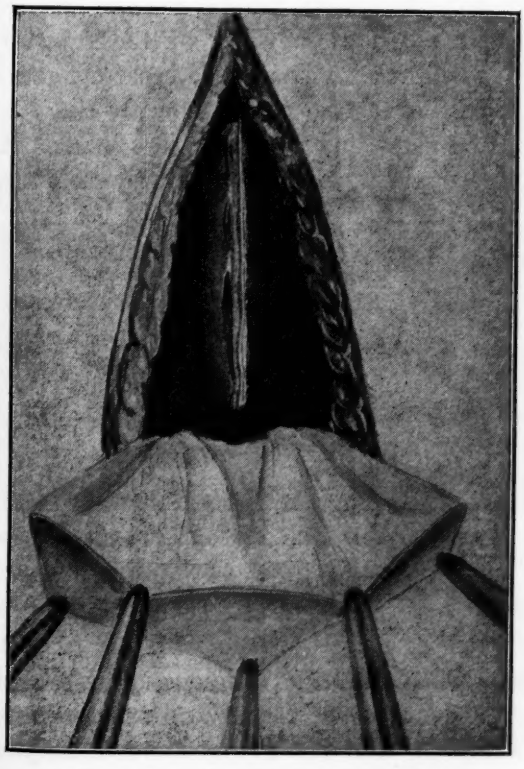

Fig. 8. Peritoneum sutured longitudinally.

The opening in the peritoneum is closed with a continuous longitudinal lock suture, not by a purse-string suture, plain catgut, No. 0 or 1 being used, and the peritoneum is allowed to drop back. The sac is raised up by pulling on the forceps, this maneuver bringing into view the vas, internally, and the vessels of the cord, externally (figures 9 and 10). Both these structures are caught and held (figure 11)

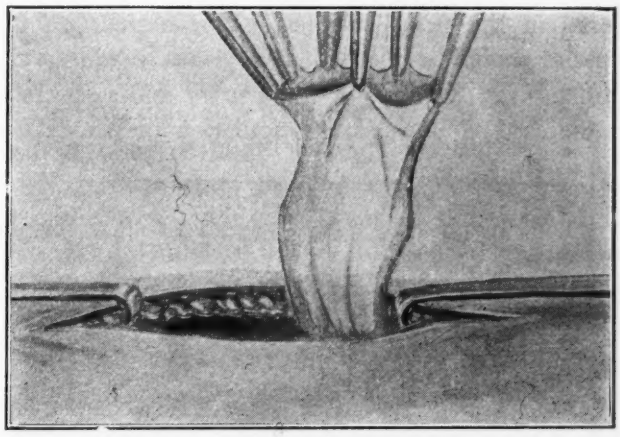

Fig. 9. Manner of pulling up the sac, which will show the vas and vessels of the cord as in figure 10.

between the round ends of towel forceps. The sac can be dissected completely, partially or left alone;

Fig. 10. Vas internally and vessels of the cord externally, the sac shown between.

in the latter cases we have dissected away only the portion which was freed in gently pulling upon the forceps (figure 9) in order to bring into view the vas and vessels without attempting any further dissection. The vas and the vessels are well separated

by blunt dissection, and the transversalis muscle and fascia are sutured between them with plain catgut, No. 1 (figure 12). Then an extra suture is put under each of the loops formed by the vas and the vessels (figure 13). The internal oblique is sutured above the vessel and the vas with a couple of stitches of running lock suture, and the fascia and skin are closed in the usual manner. The sutures on the muscles should not be pulled very taut, because very taut sutures strangulate the tissues and, especially in the case of muscles, strangulation means devitalization of fibers, which would be later supplanted by connective tissue—obviously a poor substitute. This is a very important point that must not be neglected in performing the operation above described.

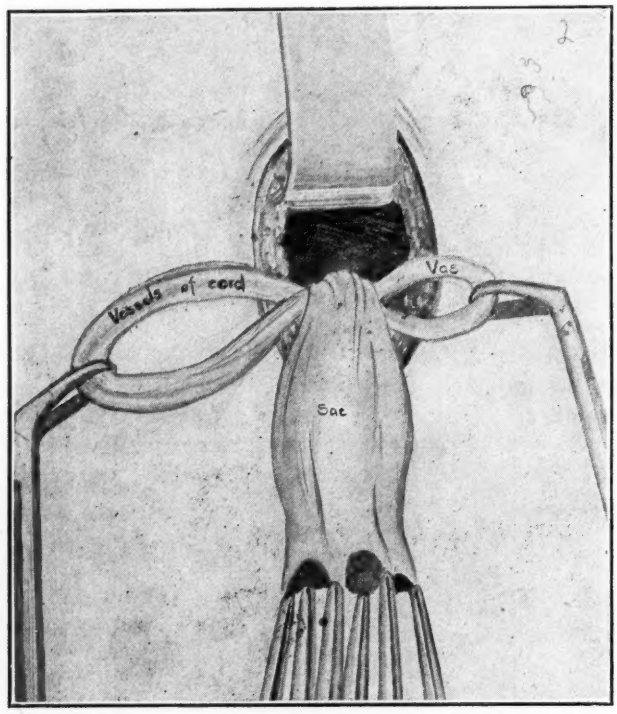

Fig. 11. Vas and vessels of cord raised up with towel forceps. (In figures 11, 12, 13, the vas and the vessels of the cord are *exaggeratedly* pulled out in order to better demonstrate the procedure described: in actual work they are pulled out only as much as is required for the placing of the sutures between and under them).

The objection raised to this operation will be that we create four small openings in the transversalis muscle. It seems to me that, after having completely removed the dimpled depression in the peritoneum, which is in reality the point of origin of indirect inguinal hernia, and separated the vas and the vessels of the cord and put between them a layer of muscle and fascia (transversalis), then reinforcing these points with another muscle (the internal oblique and the fascia of the external oblique) we have provided a stronger protection by the formation of these new small muscular reinforced openings than if other procedures were followed. It seems also that the separation of the vas and vessels, as pointed out first by Torek, adds an element of strength to the reconstructed structures, and this separation and reconstruction is easily and satisfactorily accomplished by following the technic described. The dissection and suture of the peritoneum, as recommended; the special suturing of the transversalis fascia and muscle and of the internal oblique form a kind of sling at the point (internal ring) where hernia originates and prevents its recurrence, as would a couple of fingers constantly held against this point. The complete dissection of the peritoneum, which is possible only with the technic described, has shown that the operation of herniorrhaphy, as generally performed, does not remove the sac as high up as it should and leaves a dimpled depression in the peritoneum, which predisposes to the recurrence of hernia. In order to avoid the formation of this dimpled depression we have ad-

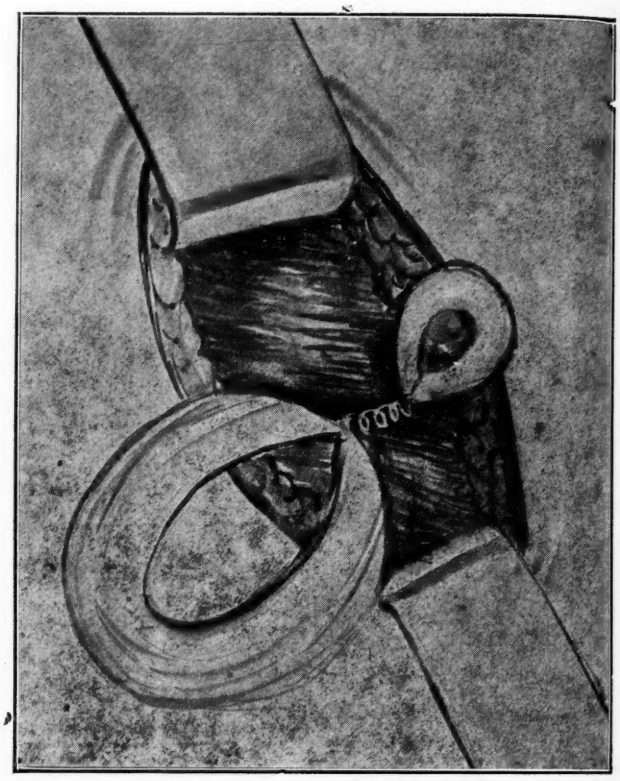

Fig. 12. Suture of transversalis fascia and muscle between vas and vessels of cord.

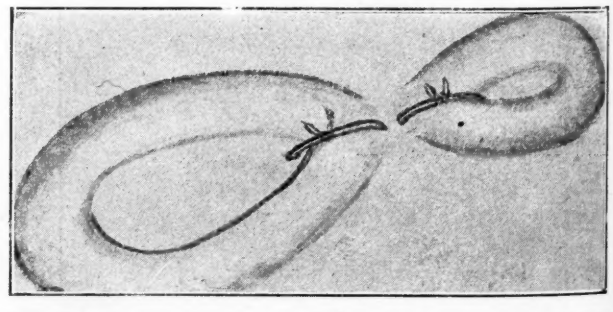

Fig. 13. Suture placed under the vas and under the vessels of the cord.

vised the longitudinal suture of the peritoneum, which gives a smooth union, while the purse-string suture predisposes to the formation of a dimpled depression by tying abundant tissues in a circular manner.

It seems to me also that the technic recommended has great advantages, because it allows a complete dissection of the peritoneum and removal of any depression in it; requires a very small incision, which does not interest important structures and, therefore, causes slight injury to the tissues and specially to the abdominal wall; repairs the hernia at its point of origin; prevents injury to the deep blood vessels; can be readily done under the most perfect and easily applied regional anesthesia. The technic described is extremely useful in strangulated hernias, because it allows a perfect view of all the structures concerned, and, therefore, prevents injury to them.

The technic is especially indicated in children because, by preventing reformation of the sac, we do not need to dissect the cord and separate it from the sac as done in the Bassini operation, nor is there any danger of injuring the bloodvessels of the cord or the vas, either during the dissection or during and after the repair is completed; indeed, we have observed that following the Bassini operation many children show a decided atrophy of the testicles a few years later, atrophy which cannot occur if the technic here advised is adopted.

I wish to emphasize the fact that I am speaking only of indirect hernias, because obviously in the direct variety we have to repair the lower portion of the inguinal canal through which the hernia forms. When there is a combination of direct and indirect hernia, I now resort to the technic described, completed by a modified Bassini operation, to be described later.

I have patients who have been operated upon over two years ago, and I feel justified in recommending the technic described which, with a little practice, is of very easy application, safer and appears to be more rational than other methods now in use.

In the not distant future physicians will be expected to publish the mortality of drug treatment, just as surgeons at present are expected to publish the mortality of operative interference. The drug mortality of some physicians is a very high one, yet few physicians have ever realized that they also possess a treatment mortality, which can be compared to the operative treatment mortality of the surgeons.—FRANK KIDD in *The Lancet.*

A FEW POINTS IN THE TECHNIC OF CLEFT PALATE OPERATIONS.

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The ultimate object of cleft palate operations is to secure a firm diaphragm for the roof of the mouth and at the same time have a soft and inflexible velum. To have such a velum it must be free of scars and maintain its normal muscular attachments, otherwise the patient will always have difficulty in articulation.

Many and ingenious operations have been recommended for cleft palate; also mechanical devices. But who wants to wear an obturator? In my work I use the Warren or Langenbeck methods. The successful outcome of cleft palate operations depends upon the proper mobilization of the flaps with a minimum loss of tissue and intact blood supply to the flaps; so that when ready for the sutures the flaps lie in apposition without tension. Any tension on the sutures spells failure. Such matters are fundamental in cleft palate work.

Before mobilizing the flaps it is well to remember the blood supply of the palate. While the palate is supplied with blood from the anterior and posterior palatine arteries the main supply comes from the posterior vessels and if these are torn in the mobilization and the anterior vessels are small and also damaged sloughing will follow. For that reason it is best to do the operation in two stages.

It is immaterial if one does the anterior or posterior operation first. Personally, I prefer the anterior end of the cleft first because I fancy I do less damage to the blood supply and, too, I cause a larger collateral circulation to develop in the anterior part of the flap following mobilization.

If one attacks the posterior part of the cleft first the mobilization should stop about one-half to one inch from the anterior end of the cleft or, which is more to the point, the danger signal is as soon as the muco-periosteum begins to pale during mobilization.

Of course, one may operate upon the entire cleft in one stage, time and again, with success, and then disaster come in another case. A slough follows too free mobilization. Such a calamity I have seen occur, but I have, fortunately, not had the experience in my own operations.

Another element of a successful cleft palate

operation is the thorough separation of the velum from the posterior border of the hard palate. It must be complete, otherwise there will be tension and cutting out of the sutures. It is absolutely unnecessary to trim away any tissue from the edges of the cleft, as the proper application of the sutures will turn up broad raw surfaces for apposition. Conservation, not waste, of tissue is the supreme object in cleft palate work.

Having then mobilized the muco-periosteum and separated the velum from the posterior edge of the hard palate, to make certain I have left no tags of attachment I always feel with my fingers. Having mobilized the muco-periosteum it is an easy matter to split the velum back to the tip of the uvula. This gives a broad raw surface for apposition in velum and uvula.

Under such circumstances when mobilization has been thorough, mechanical devices to hold the flaps together are unnecessary. Neither is it necessary to make lateral incisions in the velum except in loss of tissue following a gumma, etc., as such incisions destroy the normal muscle relations, make scars, and give a velum without control. While I do not use mechanical devices, such as lead or silver plates, on either side of the median raphè, I do use gauze packs in the lateral incisions between the muco-periosteal flaps and gums. This I do, for two purposes: first, to stop bleeding, and second, to tire out the flaps, as it were, and take tension off the sutures. One end of each gauze pack is brought out at the angle of the mouth and secured to the cheek with adhesive plaster. The packs are removed in 24 or 30 hours or as soon as any odor develops. The most frequent point of non-union is at the junction of the velum and the muco-periosteum due, no doubt, to faulty mobilization.

After the tissues have been properly mobilized, the next vital consideration is to insert the proper sutures in the proper place. I use No. 30 silver wire, placing two vertical mattress sutures ¼ inch apart at the junction of the velum and muco-periosteum. I also place one or two vertical silver wire sutures forward in the muco-periosteum. Such sutures tied lateral to the edges of the wound bring broad raw surfaces vis à vis in fact, quite an elevated median raphè is formed.

Having properly placed the silver wire sutures—which act as stay or tension sutures, I further fix the edges of the mobilized muco-perisoteum with fine silk No. E on a small Hagedorn needle with vertical mattress sutures tied lateral to the median line. This further prevents the edges of the flaps from turning in.

What has just been said of sutures applies to the muco-periosteum. In suturing the velum and uvula I use the vertical mattress suture of No. E silk on a fine Hagedorn needle. However, it is important to introduce the needle in such a way that it will emerge from one raw surface and enter the raw surface of the opposite side under the mucosa, tying lateral to the median line. The suture first enters the mucosa about one-quarter of an inch from the edge of the cleft, passes through the entire thickness of the velum to the under surface of the upper mucosa on the same side, emerges from the raw surface, enters at a corresponding point on the opposite side, traveling on the opposite side a similar course, and emerges on the free surface of the under mucosa, one-fourth of an inch from the cleft edge. When returned, it is entered one-eighth of an inch from the cleft, passes under the lower mucosa to the raw surface and traverses a similar course on the opposite side. Such a suture is for all practical purposes buried and when tied lateral to the median line approximates broad raw surfaces and forms an elevated median raphè on the upper and under surfaces of the opposite flaps, which prevents any entropion of the cleft edges; besides the knot is lateral to the median line. A suture knot tied over the freshened edges of a wound, acts as a foreign body, which frets the raw surfaces, creates an ideal depot to harbor germs, and favors infection.

SUMMARY

For a successful cleft palate operation the operator must thoroughly mobilize the flaps so that they lie in apposition without tension. The flaps must have a maximum blood supply and a minimum loss of tissue. It is absolutely unnecessary to trim away any of the flap tissue. Lateral incisions in the velum (except with very restricted reservations) are inexcusable. (I called attention to this phase of the operation 12 or 15 years ago in a communication to the International Journal of Surgery).

Lead or silver plates are unnecessary. The proper sutures in the proper position are all-sufficient. The two-step operation gives better results and is safer than the one-step operation.

THE SURGERY OF SPLENIC ANEMIA.

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(Concluded from the August issue)

VIII. END RESULTS OF SPLENECTOMY.

In 1910 Banti analysed 36 cases of the disease bearing his name, in which splenectomy was performed. In the first stage he obtained 3 cures out of 4 cases by splenectomy after 5, 6 and 15 years. In the second stage he cured 13 cases out of 22 splenectomized after 7, 8 and 14 years. In the third stage he reports 4 out of 10 cases cured by splenectomy.

Wm. J. Mayo reports that at the Rochester Clinic, 29 definite cases of splenic anemia had been treated by splenectomy up to September 20, 1915. All but 5 of the patients recovered from the operation and have remained well in spite of the fact that some were in the last stages of the disease, that is, markedly advanced hepatic cirrhosis, ascites and jaundice.

Hitzrot reported 2 living cases of so-called Banti's disease in 1918. At the time of the report one case, though in excellent health, had been operated upon but six months previously. In a personal communication of January 28, 1921, Hitzrot stated that this patient had left New York. He has no other personal note later than February 14, 1918. A friend of the patient reported in December, 1919, that he is working and is perfectly well. The second case has returned to Italy and is serving in the army. The details of this case are too brief to report at length, as the case was followed but sixteen days. Both patients had improved in appearance, felt stronger and both had gained in weight since the operation—one 35 pounds at six months and the other 30 pounds at four months and both had resumed their occupations. One case showed at nine months the changes mentioned above and the other still is in good health.

Sweetser reports end-results in 37 cases in his series, 1 was a failure from the start, requiring paracentesis twice a week but was still alive eight months after operation; 1 suffered repeated hemorrhages from the bowel and succumbed at the end of five months; 1 was apparently in perfect health at the end of a year but suddenly died 2 months later from a hemorrhage from the stomach; 6 were alive and well at last report from a few months up to fourteen months after operation; and 17 were alive and well for periods varying from fifteen months up to ten years after operation. Fifty-five per cent. of the cases that survived operation lived and remained in good health for more than fifteen months, and may therefore be assumed to be permanently cured. The three cases with definite syphilitic etiology all recovered and 1 was in perfect health at the end of seventeen months.

Splenic anemia in infancy and in childhood: I accept Giffin's division into two types. Type I conforms to the blood picture as seen in the adult form (with leucopenia) and type II corresponds to von Jaksch's anemia showing a leucocytosis and a more pronounced picture of blood destruction. There are but few reports of type I, the adult type, in which splenectomy has been performed. A variety of syndromes in children must be carefully excluded, such as Gaucher's disease, hemolytic jaundice and other splenomegalias. Giffin has collected the literature of splenectomy in this type. He includes, however, a doubtful case reported by Bland-Sutton in 1896 in which the blood examination and pathologic findings are not described. The case resembled this type in that the patient was five years of age, had anemia and enlarged spleen, not due to "leukemia, syphilis, rickets or lardaceous disease". The spleen weighed ten ounces. Eighteen years later the patient was a perfectly healthy woman.

In 61 cases treated by splenectomy up to December 31, 1918, at the Mayo Clinic, there were 7 (11%) operative deaths. The deaths occurred in patients operated upon in the late stage of the disease, in which there was a high grade of anemia, cardio-renal manifestations and ascites. Many patients splenectomized in the late stages of the diseases with marked ascites, and frequent hemorrhages from the stomach, have been cured.

Wm. J. Mayo reports a total of 71 splenectomies in splenic anemia of unknown origin up to January 1, 1921, with 9 deaths. Under this title he also includes 38 cases of splenic anemia of known origin.

Because of insufficient data, widely varying classification and interpretation of pathologic findings, it is a difficult matter to assemble in a collective series reports of isolated cases. The syndrome requires careful study, interpretation and correlation and conclusions can be most satisfactorily drawn from a continuous series emanating from a single clinic as presented by the Mayos. Sweetser has recognized difficulty in classification and correlation. He has analysed 42 cases in which splenectomy was performed for splenomegalia with ascites. He includes, however, under this caption, cases which cannot be included in our classification of splenic anemia, namely 7 cases of primary cirrhosis of the liver with ascites (Sherren, Mayo), 1 case of thrombosis of the splenic and portal veins and 1 case of primary lymphosarcoma, which are recognized as separate and distinct entities.

Prior to 1918, Sweetser informs us there were 11 cases reported of splenic anemia with ascites with a mortality of 72.7%, between 1908 and 1913 there were 16 cases reported with a mortality of 56%. In 42 cases reported by Sweetser with 11 deaths, the mortality was further reduced to 26.5%.

Luce reported a splenectomy (November 16, 1908) upon a girl aged six years. The case was carefully studied and conformed quite closely to the syndrome of splenic anemia. There was no history of syphilis or familial tendency. The spleen extended five cm. below the costal margin, and the blood showed hemoglobin 30%, red cell count 2,100,000, and leucocyte count 6,700. There was considerable evidence of blood destruction with an occasional normoblast in the smears. The spleen weighed 240 gm.; there was hypertrophy of the follicles, and relative atrophy of the lymphatic elements and marked

engorgement of the sinuses. Nine months after operation the patient was in excellent condition.

Southerland and Burghard reported a splenectomy (1910) in a girl six years of age, in whom the hemoglobin was 30%, the red cells about 1,870,000, and the white count 2,400. A very faint jaundice was present. Two months later the hemoglobin was 65%. The spleen showed a generalized hyperplasia and weighed one pound. This case was reported as splenic anemia but is mentioned by Elliott and Kanavel as being a probable case of hemolytic jaundice.

Barling reported a splenectomy (February 25, 1914) in a girl aged six years, who vomited blood ten weeks previously. The spleen extended three inches below the costal margin. The hemoglobin was 60%, red cell count 3,600,000, and the white varied from 7,000 to 26,000. This case also cannot be accurately classified in this group assigned to it by Giffin because of the fact that the differential count and pathologic description of the spleen were not given. Death occurred on the fourth day after operation and at autopsy an acute hepattiis was found.

Giffin adds to the above series a case falling in this group in which Balfour removed a spleen from a girl, aged 2½ years with recurrent attacks of hematemesis, pallor and loss of strength. Before operation the blood examination showed a secondary type of anemia with a color index of 0.4 and an absence of leucocytosis. The hemoglobin was 20%, red cell count 2,010,000. The red cells showed marked anisocytosis and moderate polychromatophilia and only one normoblast was seen while counting 300 white cells. There was no increase in the fragility of the red cells. The leucocyte count was 4,000. A differential count of 300 cells showed polynuclear neutrophiles 22.7%, small lymphocytes 50%, large lymphocytes 12.32%, eosinphilis 12.3%, basophiles 2.3%, neutrophilic myelocytes 0.3%.

Giffin has also analysed cases in the literature falling under type II of his classification. He mentions but four authentic cases of this type in which splenectomy was performed.

Wolf operated on a boy aged eighteen months, in whom there was a sixteen months history of illness. The spleen was very large, the blood showed a hemoglobin of 40%, a red cell count of 467,000 and a white cell count of 37,800. The differential count showed a lymphocytosis and the presence of mast cells and eosinophiles. There was considerable poikilocytosis and anisocytosis. Many normoblasts and megaloblasts were present. The child was in very poor condition. Ascites was present, the liver was enlarged and operation was advised as a last resort. Splenectomy was performed July 29, 1905. The spleen weighed 500 gm. and showed an induration of the connective tissue framework, but no enlargement of the Malpighian bodies. There was no increase of lymphocytes in the spleen pulp.

Graff, in 1908, reported a case in a fifteen months old baby upon whom splenectomy had been performed in the summer of 1907. The family history was negative; the child had apparently been normal until the tenth month. After this time the appetite failed and the child lost weight, while there was a gradual increase in the size of the abdomen. At the time of the examination the patient was emaciated, yellowish-white in color and weighed only 11 pounds. There was evidence of mild rickets. The spleen extended beyond the midline and downward to the symphysis. The liver did not seem to be enlarged. The blood showed a hemoglobin of 45%, red cell count of 1,800,000 with many normoblasts. The white cell count was 37,000 and an examination of the smears showed a lymphocytosis. The spleen measured 16 x 10 x 8 cm. and weighed one pound or nearly one-tenth of the body weight. It was very firm and hard. It showed an increase of connective tissue, occasional hemorrhages, small collection of lymphocytes and giant-cell like structures similar to bone-marrow giant cells. There was no evidence of tuberculosis or tumor. In nine months the patient was quite well, weighing 21 pounds, and the blood was almost normal.

Russell Fowler performed a splenectomy in April, 1914, on a fourteen months old girl baby in whom the spleen was much enlarged, the liver was apparently normal and the blood showed a hemoglobin of 50%, a red cell count of 3,316,000 giving a color index of 0.9% with many normoblasts and occasional megaloblasts in the blood smears, together with a considerable variation in the size and the staining qualities of the red cells. The leucocyte count was 30,000 with poylnuclears 40%, large mononuclears 12%, and small mononuclears 38%. This case was much improved one month after operation.

Fowler reports a second splenectomy on a male child of 5½ years, in July, 1914. Both liver and spleen were much enlarged. Ascites and repeated attacks of epistaxis developed. Blood counts showed a persistent high color index with a marked anemia but no megaloblasts. Normoblasts were quite numerous from the onset. Ten blood examinations showed an average red cell count of 2,160,000 and an average hemoglobin percentage of 56. The leucocytes varied markedly, usually ranging around 11,000, but on one occasion reaching 36,000. The polynuclear count was low throughout, averaging about 44 per cent.; once it was as low as 23 per cent. This case made a good recovery, the convalescence being tedious because of the profound anemia, but it was otherwise uncomplicated, except for pains in the long bones. The red cells and percentage of hemoglobin decreased for a few days, then gradually increased. A leucocytosis (19,400 at first, gradually decreasing day by day) persisted for some days. The various types of white cells maintained approximately the normal proportion. After leaving the hospital the child died of recurrence of intestinal hemorrhages.

Pool performed splenectomy on a boy of nine months on August 17, 1914, after a preliminary blood transfusion of 150 c.c. The infant had been born at seven months and nutritional disturbances had been troublesome. The child was poorly developed, anemic and showed evidence of rickets. The liver extended 2 cm. below the edge of the ribs and the spleen 5 cm. below the left costal margin.

A Wassermann test was negative. The patient had been on preliminary medical treatment for six weeks before improvement. The hemoglobin before operation varied from 30% to 45%, the red cell count from 1,400,000 to 2,400,000 and the leucocytes from 17,000 to 54,000. A differential count showed polynuclears 35%, eosinophiles 2%, lymphocytes 40%, transitionals 3%, large mononuclears 6%, and myelocytes 5%. Normoblasts had varied from 6 to 66 per 100. There were two or three megaloblasts. This child is said to have died of broncho-pneumonia 2 months after discharge from the hospital.

In Hitzrot's series (1918) splenectomy was performed once for von Jaksch's anemia. The child, a girl of nine, showed no improvement under medical treatment and steadily lost ground. Before operation the hemoglobin was 23%, red cells 2,100,000. No nucleated red cells were noticed and the vital cells were 145 in 500 counted. Hemolysis began at .62 and was complete at .44. The child improved rapidly in weight on exactly the same diet she had had before operation. In this case the effect of the splenectomy was even more striking than in Hitzrot's acholuric jaundice cases.

Canelli, apparently without differentiating Giffin's types collected 30 cases in 1921, diagnosed as primary splenomegalia in children of the so-called Banti type. Of these 7 were listed as cured, 13 had already died. Splenectomy was performed in 12 of the 30 cases. All of these were cured or improved except one infant four months old.

Bartlett has recently collected from the literature 20 splenectomized cases diagnosed splenic anemia occurring in children under 14 years of age. Of these 7—Pool, Fowler (2), Giffin (op. by Balfour), Sutherland and Burghard (doubtful), Luce, French and Turner—have been mentioned in my series. Excluding from Bartlett's series a doubtful case and adding 3 not mentioned by him (Wolff, Graff and Hitzrot) the total of reported children under 14 years splenectomized for splenic anemia number 22.

It is seen that excellent results for the most part have been obtained in very severe types of the disease in children. There was no immediate mortality. Wolff's patient was in excellent condition three years after operation, Graff's patient had improved markedly nine months after operation and Fowler's first case was in satisfactory condition one month after operation. His second case died of recurrent intestinal hemorrhages. Pool's patient showed remarkable improvement for two months but at three months was reported as in far less satisfactory condition and ultimately died of broncho-pneumonia. It is emphasized by Wolff that splenectomy in children should for the present, be reserved for severe cases of the disease. The milder types improve under medical treatment, but the severe types usually die of some intercurrent affection. In Canelli's 12 cases 11 were cured or improved. In Bartlett's series the end-results were not stated in three of Giffin's cases. Excluding these and four that ultimately died, the remaining 13 show cure or great improvement (65%).

Syphilitic Splenomegalia: Observations now covering a wide field of experience point to the possibility that a large number of cases of splenic anemia are due to syphilis. Frequently gummas and other specific changes are found in the spleen in aberrant form in addition to fibrosis and thrombophlebitis. Spirochaete pallida may be found.

In the majority of syphilitic enlargements, energetic specific treatment is followed by diminution in the size of the organ and restoration to health. There are certain cases, however, in which syphilis is believed to be the cause of the enlargement in which such treatment is not efficacious. It is in this group that there is a field open for the surgeon. In Hey Grove's patient, quoted by Thursfield and Gow, a woman of 40 had symptoms dating from early infancy and a liver grossly deformed. A spleen weighing 1,587 grammes was removed. Splenectomy and omentopexy enabled her to resume an active life.

French's case of a boy of 5½ years was described as an example of von Jaksch's anemia. This boy had a strongly positive Wassermann reaction, and his younger sister presented a precisely similar condition. Whatever the exact diagnosis, excision of the spleen showed brilliant results, especially on the growth of the child. Stress is laid on this last point because Paulicek's patient, a girl of 17, who presented an infantile aspect with absence of pubic and axillary hair, developed rapidly after operation. A year later menstruation was established for the first time, the girl had grown 4 inches in height, and had to a large extent lost her infantile appearance. The nature of this case is uncertain and many features are strongly suggestive of congenital syphilis.

Giffin, of the Mayo Clinic, in 1916, collected and analysed 6 splenectomized cases of syphilitic splenomegalia including three of their own. He mentions the early case of Coupland, who in 1886 reported a case of splenectomy for syphilitic spleen. Two years after operation the patient died following hematemesis. Ascites had been present. Autopsy revealed a scarred liver typically syphilitic. Hartwell (1913) performed splenectomy on a patient with a severe anemia of the secondary type and a history of hematemesis. The patient denied the possibility of syphilitic infection, but a Wassermann test was strongly positive. Neosalvarsan, mercuric salicylate, potassium iodide, iron and arsenic had been administered while the patient's condition became less satisfactory. Splenectomy was followed by very prompt improvement. In two weeks the hemoglobin had risen from 25% to 80%. Pathologically, the trabeculae were thickened and large and numerous follicles having fibroid centers were present. Mention of gummas was not made. French and Turner (1914) removed a spleen measuring 7 x 5 inches and weighing 18 ounces, from a boy aged five years, in whom there was a blood-count suggestive of the splenic anemia of infancy. A Wassermann test had been positive several times and the patient had received antisyphilitic treatment with no benefit. The patient was apparently well in two months.

The Mayos have operated upon 6 cases in all of syphilitic splenomegalia up to January 1, 1921, with

one hospital death. Details of three of these cases were reported by Giffin in 1916, but I have not seen an analyses of end-results in the recent literature of the subsequent cases. These cases indicated that the spleen harbored spirochaete and were resistant to medicinal specific treatment. The patients were sufferers from chronic anemia and after splenectomy were at once made amendable to further treatment and recovered quickly. Characteristic portal cirrhosis of the liver is a terminal stage and results in death from circulatory obstruction, ascites and gastrointestinal hemorrhages as in other types of splenic anemia.

Tuberculous Splenomegalia: Winternitz analysed 52 cases in 1912. Some with symptoms and blood pictures of splenic anemia have been so reported which operative and pathological findings have later indicated to be due to the tubercle bacillus.

G. W. Cottis reported in 1916 under the caption of splenic anemia, a case of tuberculosis of the spleen in a woman of 48. Outstanding features were weakness, loss of weight without pulmonary symptoms, pains in the neck and back radiating from the left scapular region to the left side of the body, epigastric discomfort and yellow tinge to skin. No palpably enlarged lymph glands. The spleen was enlarged and extended almost to the iliac crest and was tender; the liver extended one inch below the free border of the ribs. Blood showed: hemoglobin 45%, red blood cells 5,120,00, moderate poikilocytosis, platelets normal, Jolly-Howell bodies present, white blood cells 8,700, differential count (400 cells): polynuclears 77%, small lymphocytes 18.25%, large lymphocytes 2.75%, transitionals 1.50%, basophiles .50%, eosinophiles 0. At operation a large, firm, dark-red spleen was delivered into the wound. Splenic vein very large and friable. Spleen removed. There was no evidence of perisplenitis. Intestines and mesenteric nodes appeared normal; liver slightly large, surface smooth. Gall-bladder tightly contracted on a mass of gall stones. Cystic duct ligated and gall-bladder removed without being opened. The wound healed by primary intention and convalescence was uneventful until November 19th, when the temperature rose to 100.4° and the patient developed burning pain in the stomach, emesis of sour fluid and severe abdominal pains. These symptoms continued for one week, when they gradually subsided. Blood examination, November 25th: hemoglobin 55%, red cells 5,500,000, leucocytes 7,000, differential normal. The patient left the hospital free from symptoms and with increasing strength and weight and continued to improve up to the time of Cottis' report. The pathological report indicated that sections of the spleen showed tubercles. In many areas the tubercles were fused and little splenic tissue was to be found. Here and there a Malpighian body was easily recognizable, but most of the splenic tissue had been replaced by tubercle. There were many giant cells, some of which contained tubercle bacilli.

The preceding case may be classed as one of primary tuberculosis of the spleen, not in the sense that the spleen was the portal of entry of the organism, but that the disease process had localized itself in the spleen, while the original focus may have healed entirely.

Writing in 1916, Wm. J. Mayo, states that their one case of tuberculosis of the spleen died from general miliary tuberculosis after a temporary improvement of several months.

In the more chronic cases splenectomy has been performed, according to Winternitz, 17 times: 10 of the patients recovered from operation, 5 died and in 2 the result was not known. Douglas and Eisenbrey reported in 1914, a case of tuberculosis of the spleen with polycythemia and splenomegalia. The patient died nine days after operation from an acute vegetative endocarditis.

Bufalini reports a recent case of tuberculous splenomegalia as primary in a woman of 37, who had been feeling weak for a month and in whom a tumor developed in the region of the spleen. On assumption of Banti's disease the spleen was removed and recovery followed, but the spleen proved to be the seat of tuberculous process of the miliary type. Bufalini compares with this case five similar ones. The spleen was removed in all of the five but one in which adhesions rendered splenectomy impossible.

The subsequent course of the blood picture is much the same in cases of splenic anemia as in splenectomy for lesions unaccompanied with anemia. That is, after a period more or less prolonged, but usually about one or two years, the blood picture becomes normal and the blood behaves to infections exactly as does that of persons who still retain their spleens.

Harvey Cushing gives the interesting end-results in a case of splenic anemia, Mr. C. D. B., who was operated upon by him in 1898 when resident surgeon at the John Hopkins Hospital. The man recovered. This case was subsequently referred to in all of Osler's three papers. Cushing followed this case and the last report is dated February 13, 1920. twenty-one years after his splenectomy. Hemorrhages have occurred repeatedly, the last in July, 1918, when the patient vomited about a quart of blood which he attributed to pitching hay. Cushing cites the case of Mr. C. D. B., as quoted by Gaston Torrance in his article on "Splenectomy in Banti's Disease". Torrance collected 36 cases of which Mr. C. D. B., is XII. Concerning this patient Torrance states, "He made a good recovery and gained 30 pounds in weight. He was reported well and living eight years later with no return of the hemorrhages". The moral of Dr. Cushing's narrative is self-evident and serves as a warning in this particular class of case against hasty estimation of the value of splenectomy.

Tropical Splenomegalia: Richards reports 22 splenectomized cases of tropical splenomegalia with 4 deaths. Two were in the final stage of the disease. Excluding these two cases statistics show a mortality of 10%. The final results of the cases operated upon by Richards and Aly Bey for Egyptian splenomegalia show that 18 cases were successful in that the patients left the hospital in better condition than

when they entered it. These cases were seen nine months to two and a half years after operation and were in good condition, some of them doing hard physical work.

Malarial Splenomegalia: Splenectomy *per se* does not cure the disease. Jimenez and Pittaluga report recurrence following removal of the spleen. Their patient gave a history of 4 years malarial infection, irregularly treated by herself. The spleen was very large, indurated and movable. Splenic puncture and repeated blood examinations with and without the adrenalin test, failed to reveal malarial bodies. On account of the size and mobility of the spleen, it was excised by a left pararectal incision. The patient made a good recovery from the operation, but when about to be discharged, she suffered a severe chill, followed by high fever, with all the signs of an acute malarial attack. A blood examination then revealed a large number of plasmodia. The patient was put upon an intensive treatment with quinine, arsenic and iron and was discharged five days later in good condition. The findings of many malarial forms after splenectomy, when previous examinations had been entirely negative, suggests that splenectomy determined a relapse, by occasioning a disequilibration in the bone marrow activities.

Enlargement of splenunculi following the removal of the spleen proper has been said to occur as a normal compensatory phenomenon, but enlargement of such accessory spleens is rarely actually seen. Eccles and Freer report the case of a man, a football player, who sustained a rupture of his spleen necessitating its removal. The patient had contracted malaria previous to the accident, and the enlargement of his spleen may have contributed to the ease with which it was ruptured. He made a somewhat complicated recovery, having what was thought to be mild malaria and some trouble at the base of the left lung. On full recovery he was able to carry out his duties without any untoward symptoms and states that he was assured that he would not suffer again from malaria as he was minus his spleen! He continued in good health for eight years, after which he began to have attacks of weariness and was found to have an evening rise of temperature. It was considered by his medical advisers that this might be due to some obscure form of tubercle. His blood count was virtually normal. In general health he appeared well and was not anemic. There was a wide gap in the upper third of the left rectus, and on coughing a marked protuberance of abdominal contents took place. On opening the abdomen some adhesions of the omentum were found and separated. Then, to the astonishment of all present a well-formed, normal-looking spleen was seen in the usual position. The shape, size, notch, color, and consistency all appeared to be that of a normal spleen.

IX. Complications of Splenectomy.

These are not numerous. The most serious are sepsis, hemorrhage and left-sided intrathoracic lesions. The latter occur as the result of separation of adhesions high in the dome of the diaphragm.

Polycythemia in moderate degree is extremely frequent during the first two years after operation. In 12 out of 21 cases reported by Thursfield and Gow in which the post-operative blood count was recorded there has been a red cell count varying between 5,000,000 and 6,000,000. In Schupfer's case there was, in addition, a marked cyanosis of the hands and feet, a condition very rarely noticed. In one case of Thursfield and Gow, the patient 19 months after operation had a hematemesis or hemoptysis—it is uncertain which, and a little later brought up a silk ligature which had been used to tie the splenic pedicle. A similar incident was recorded many years ago by McGraw. In that instance it appeared most likely that the ligature was restored to the light via the left lung, in which there had been signs of inflammation.

The poor results that occasionally occur may usually be traced to late operations, to persistence of the disease and extension to the liver and portal system. In three patients of the 7 who died in the Mayo series of 61 cases reported up to December 31, 1918, acute thrombosis of the superior mesenteric and portal veins was the immediate cause of death. Extensive thrombosis evidently of long standing, was found in the splenic veins. These observations are in accord with those of Dock and Warthin, who found extensive thrombosis of the splenic vein in two patients who died from splenic anemia and in which there was ascites without cirrhosis of the liver.

Both portal cirrhosis and splenic anemia, in the experience of the Mayos, lead to death through portal obstructions and the hemorrhages and ascites are due to back pressure. If the spleen is removed early in splenic anemia, the liver will probably not show serious evidence of disease later, and even when cirrhosis of the liver is well marked and ascites is present, removal of the spleen often effects a "near cure". The first thought is that by removing the spleen, toxins filtered from the blood are prevented from passing to the liver. On further consideration it seems to Mayo that the true explanation is this: Inasmuch as the normal spleen carries about 30% of the blood to the liver and that from these huge spleens the splenic vein may carry as much blood as the remaining elements of the portal vein, splenectomy relieves the liver of its overload and reduces its labor sufficiently to enable it to meet its demands, just as sometimes follows the Talma-Morison-Drummond operation.

The end-results of three cases of splenectomized Banti's disease are reported by Hitzrot in 1918. The two living cases have been previously mentioned. The third case was markedly improved for nine months and then, due to the increasing cirrhosis of the liver, developed ascites and in the fourteenth month a mesenteric thrombosis, from which he died. The case was a late one of its type and at the time of operation there was an advanced cirrhosis of the liver with numerous peri-hepatic adhesions. At the autopsy a well-marked collateral circulation existed between the capsule of the liver and the diaphragm, the partietal peritoneum and the omentum. The

mesenteric thrombosis was only a partial one, involving about half of the small intestine, but the patient refused any further operation and died as a result of that thrombosis.

Recurrence of gastro-intestinal hemorrhages may occur. Hematemesis is not always relieved by splenectomy. Sherren, Mayo and others have called attention to this. The Mayos had one case of this kind, but in their experience these are rare. Severe hematemesis or intestinal bleeding soon after operation, has occurred four times in the series of Thursfield and Gow. It is a serious but not necessarily fatal complication. Three of these four patients recovered. The majority of patients, however, do not suffer from this feature after the operation. The relief of hemorrhage depends in part upon the condition of the liver as pointed out by Mayo, and the underlying cause, whether due to esophageal or gastric variscosities from portal obstruction or to superficial gastric erosions of the mucosa from toxic conditions probably originating in the liver. Splenectomy relieves the portal circulation of a burden, also the liver of an overload of venous blood and toxins, but if the liver is so extensively impaired as to result in gastric mucous ulcers, hemorrhage will occur. In cases operated upon in the terminal stage the disease, with well developed esophageal and gastric varicosities it is conceivable that the beneficial effect of splenectomy (relief of the portal circulation) upon this particular lesion may be but transient, especially in the presence of an impaired liver unable to hold its own.

Among the technical errors during splenectomy may be mentioned accidental injury to the stomach which has resulted in leakage, sepsis and death. Other accidents are recorded in which a hole has been torn in the pleura and pericardium during separation of adhesions high in the vault of the diaphragm.

THE TREATMENT OF UTERINE FIBROIDS WITH ROENTGEN RAYS; WITH ILLUSTRATIONS OF ORIGINAL APPLIANCES.*

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Any remedy that can successfully combat the fibroid tumor of the uterus is a benefaction to womankind. One that can cure this ailment and make hysterectomy unnecessary, should command the attention of the entire medical profession.

The uterine fibroid tumor is, in the great majority of cases, a fibromyoma. This is a tumor of mixed elements, chiefly muscular and fibrous, though it may contain some glandular cells, and may be found anywhere in the structure of the uterus, including the tubes, and may also have its site in one of the broad ligaments. The forms of tumor occurring next in frequency are the fibroma (wholly or almost wholly fibrous), the adenoma and the myoma, although it should be emphasized that a tumor of single character is rare.

The differential diagnosis is not more difficult for the roentgenologist than for the surgeon. The latter has the advantage that he can confirm or change his diagnosis after operation while the former cannot.

Many fibromyomas, if left to pursue their way, undergo calcareous degeneration, while a very small percentage are said to become cartilaginous. Neither of these changes occurs unless the tumor has been in existence for many years. This should not be allowed to occur, but if, through the neglect of the patient or her medical advisor, it has done so, hysterectomy is the sole remedy and should be performed. For the

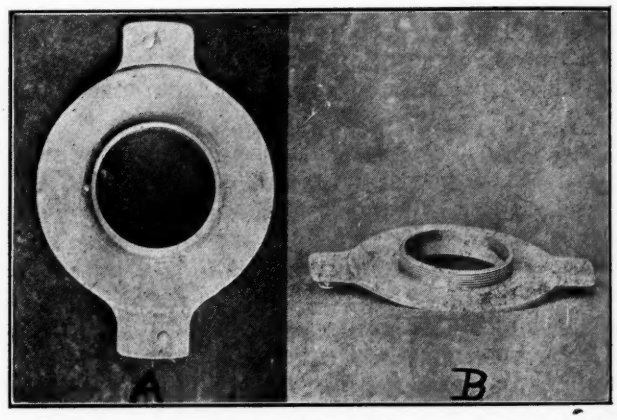

Fig. 1-*A*, a base casting, a stock appliance of one type of Victor tube stand. To this I have added a threaded boss, *B*.

growths that have not degenerated I believe the Roentgen rays to be the remedy of choice, indeed, a remedy par excellence, and I propose to herein give a brief argument to substantiate my contentions.

It is fairly easy to discover the fact that degeneration has occurred by ordinary bimanual examination, as the calcareous or cartilaginous tumor will be felt as a stony hard mass.

The great majority of these cases seek relief from the menorrhagia, one of the two prominent symptoms. Indeed, it is very often the only symptom, as a cervical tumor or a submucous growth at the fundus may cause an astonishingly profuse and persistent flow, while it is yet of an insignificant size and pressure symptoms are unthought of. This led to the belief on the part of our pioneers in this field, that it was necessary to produce a menopause in order to effect a cure, which is not true. It is admitted that inflammatory changes do occur in the ovaries and in the

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tubes, but these changes are secondary and there is every reason to suppose that both can return to a normal state when the exciting cause has been removed and that, if the cure be effected without great delay, the ovaries can resume their normal function. Our pioneer Roentgen therapists believed it necessary to treat the ovaries. I am proceeding on the assumption that it is not only unnecessary to administer the Roentgen rays to the ovaries, but that it is inadvisable. I do not believe that the cure is aided or hastened by raying the ovaries. The disease began in or on the uterine wall. The tumor found in the broad ligament most probably had its inception as a subserous tumor of the uterine wall.

I believe it highly desirable that the ovaries be fully protected from the rays, and to that end I have devised certain appliances here illustrated.

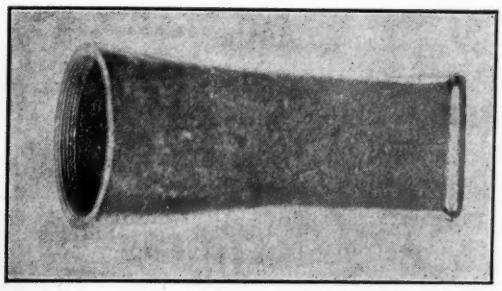

Fig. 2. A treatment appliance constructed of heavy copper, treated with lead enamel, and threaded at the top for attachment to the boss on the base casting. It is constructed to give a treatment field on the skin 3″ by 2″.

By means of these appliances it is practicable in any case to protect at least one of the ovaries and in most cases it is possible to protect both. It is true that the great majority of women requiring this treatment are already going through the menopause or have passed it; but even so, it is inadvisable and unnecessary to expose the ovaries to the rays and thereby produce their atrophy.

Procedure.

Cervical growths are treated through the speculum here illustrated. This was devised originally for the purpose of direct treatment of cervical cancer. I have employed this since December, 1913, with results with which I am greatly pleased.

The patient is put in the lithotomy position with the hips elevated. In order to relax her, and for the additional reason that the position is very tiring to her, a No. 1 hyoscine-morphine-cactine tablet is administered 15 minutes before moving her from her room to the laboratory. The speculum, triple coated with shellac, is introduced and locked to the tube stand; and the position is then confirmed by means of a head mirror. Filters are then placed in situ, the protection of the patient is provided for, the tube is clamped in the stand and the connections are made. Clearance of the patient from the wires is then assured by actual measurements. The tube stand is grounded. A 12-inch fan is played on the tube at a range of 3 feet, which enables one to use a heavy current load and thereby shorten the time of treatment without danger of overheating the tube. The distance, (anode to cervix), is 11 inches. I beg to note here that I have used this method with signal success in the treatment of papillary erosion of the cervix.

For the treatment of tumors other than of the cervix the patient is put in the dorsal position. A treatment appliance of requisite size to expose the tumor is selected. As soon as the tube stand

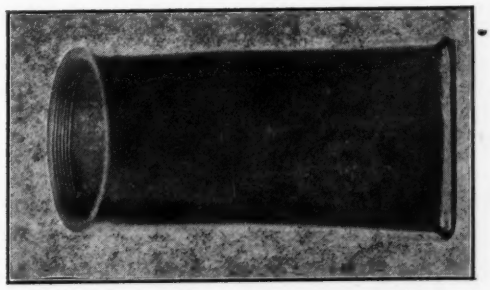

Fig. 3. An appliance exactly similar to that shown in Fig. 2 except that it provides for a treatment field 3″ square.

is in exact position, 2 layers of chamois skin are slipped between the end of the appliance and the skin, to avoid static sparking. The treatment head is lowered until there is firm pressure over the tumor. The focal distance (anode to skin) is 12 inches.

It is my practice to use heavy dosage. Some other therapists use light dosage, frequently repeated. The light dosage, it is admitted, will certainly be effective against the tumors of recent origin and low density, and may be effective against the older and denser ones. But why employ light dosage over a period of months and years, when heavy dosage or high penetration can be safely used, and the case definitely disposed of with perfect results, in a few months? In addition, it must be remembered that a certain but unknown percentage of uterine tumors ultimately show malignant character. And the light and oft-repeated doses which could be eventually effective against benign tumors would not only be ineffective against the early malignant degeneration, but in my judgment they would, in fact, have a stimulating effect upon it. I therefore employ 9 to 10 millimeters of aluminum in the filter and a back-up of 9½ inches.

The treatment is usually repeated at the end of 3 months and again at the end of 6 months. The latter treatments, however, are largely precautionary. They are necessary in case of large and old fibromyomas in order to secure a reduction of the size of the tumor to an irreducible minimum. They are not necessary on account

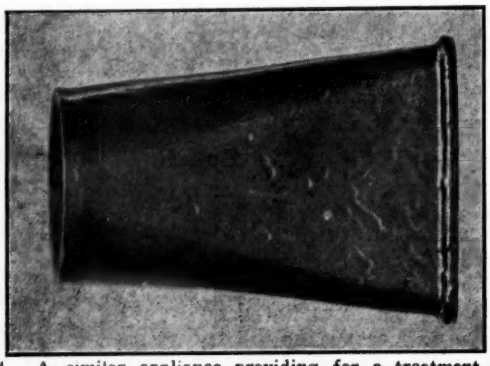

Fig. 4. A similar appliance providing for a treatment field 4" square. It should be noted with regard to each of these appliances, that they can be turned on the threads in order to expose any desired area on the skin, without moving the tube stand.

of the bleeding, for I have never yet seen the metrorrhagia persist longer than eight days after the first treatment.

RESULTS.

Naturally, the results are best in the more recent cases. In such cases there is a complete disappearance of the tumor, or at any rate re-

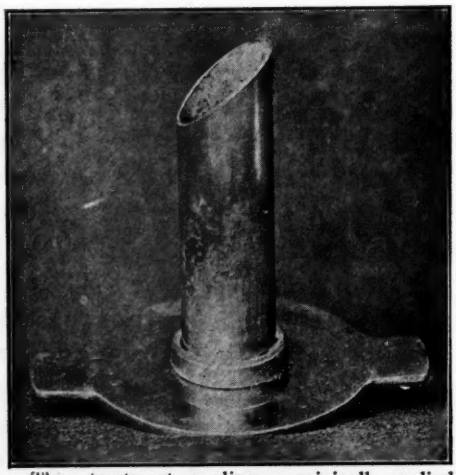

Fig. 5. This treatment appliance, originally cylindrical with rightangled extremity, was a stock appliance of one of the Victor treatment stands. Altered by making the extremity an acute angle which makes it practical to introduce as a vaginal speculum. Employed by the author since December, 1913.

duction to such a degree that it is no longer palpable or discernible. In the fibromas and fibromyomas of long standing, and which by consequence of their duration and size have a large amount of fibrous tissue, there occurs a reduction so that the patient is no longer conscious of the existence of the tumor,—a reduction to a small fibrous residue which is inert and symptomless.

RATIONALE.

Roentgen rays exert a selective effect on cells of greater activity.* There occurs a starvation of the superactive cell by depriving it of its power to assimilate glycogen.† The same explanation suffices for the effect on the thyroid, the hypertrophic prostate, and on cancer. The effect is startlingly evident on the lactating breast. For both this and the toxic thyroid are instances of a high degree of activity, that can be promptly abated by the Roentgen rays. There is a high degree of hyperplasia in gland tissue following heavy *x*-ray dosage. This is of fleeting character and must be incidental to the intense oxidation; and it is probably caused by that process, because increased oxidation could not occur without increased blood supply. This would indicate, however, that in the case of the bleeding fibroid, there would occur a temporary increase of the hemorrhage, but I have never noted such.

COMMENT.

1. *X*-rays constitute the best possible remedy for uterine tumors except calcareous tumors and chrondromata.

2. Hysterectomy is wholly unwarranted in the great majority of cases of uterine tumors.

3. Hysterectomy is a grave operation with an appreciable death rate, while *x*-ray treatment is without danger to the patient.

4. Cure of uterine tumors can be effected without producing the menopause or a dysfunction of the ovary.

210 STATE BANK BLDG.

THE ALBEE OPERATION IN THE TREATMENT OF POTT'S DISEASE. REPORT OF TWO CASES.

JOHN M. WILSON, M.D.
MOBILE, ALA.

Bone has been successfully transplanted since 1809. It was then that Merrem used bone plates in the skulls of animals after trephining. Later Walther used this technic on the human subject, obtaining partial healing of the graft in spite of the presence of infection. The French surgeon, Ollier, in 1858, after making investigations in the use of bone grafts in both animals and the human subject, found that fresh bony tissue, if it contained its periosteum, was viable. Since Ollier's time the advent of asepsis, the increased knowledge of osteoplastic surgery and the use of modern electro-operative bone instruments, have made the autogenous graft the ideal method in handling defects of the bones.

* Lodge, *Archives of The Roentgen Ray*, April, 1904.
†McCoy, *Journal Indiana State Medical Association*, June, 1915.

An English surgeon, Percival Pott, in 1779, was the first to describe a tuberculous infection of the vertebrae, attacking, in most cases, their bodies, causing a slowly developing deformity which is accompanied by pain, and sometimes by paralysis. It is thought to occur oftener in the male than in the female, and is one of the most common tuberculous diseases of bone. It may occur in any part of the spinal column, but it seems to occur oftener in the lower portion of the dorsal or the upper portion of the lumbar region. Tuberculosis of the vertebrae is usually secondary to a tuberculous focus in some other part of the body. The spinous processes and the laminae are seldom attacked by the disease. It occurs oftener in children than in adults, although it may occur at any age.

The superincumbent body weight is borne in a great measure by the individual bodies of the vertebral column, and as the disease progresses, crushing of the bodies of the vertebrae takes place, causing a backward projection, which deformity is known as *kyphosis*. In some cases the deformity takes place to one or the other sides and is then known as *scoliosis*.

The products of the softening caused by the tuberculous degeneration sometimes find their way out under the vertebral fascia, into the surrounding structures, forming what might be termed a tubercular cyst. It should not be called a true abscess, unless a mixed infection is present.

Nature has taught us that immobilization is the chief factor in arresting tuberculosis of the bone. It has been shown that it is the exception and not the rule for Pott's disease to be entirely cured by the use of the ordinary methods of fixation externally applied. Unless solid bony union is accomplished, the case can not be considered cured. To obtain this firm bony union the autogenous bone graft is a most satisfactory procedure, and is to be recommended unless there be some contraindication, which is rare. The earlier the operation, the better the results obtained.

The following two cases were operated upon by the Albee method:

CASE I.—Mrs. H., age 31 years. One uncle died of tuberculosis of the bone. Has suffered with pain in the back for a number of years. Pain was associated with elevation of temperature. The patient has undergone several operations of a gynecological nature for the relief of persistent backache. Radiographic examination of the chest showed areas of tuberculous involvement of the lungs which had very likely healed. Radiographic examination of the spine showed an active tuberculous process in the third, fourth and fifth lumbar vertebrae, and in the upper sacral region. Marked scoliosis was present. Repeated Wassermann tests were negative. The heart and kidneys were negative.

Operation at the Mobile Infirmary, May 4, 1921. The Geiger electro-operative motor saw was used to obtain the graft from the tibia. Under gas-oxygen anesthesia, and with the patient lying prone, the bed was prepared, using a curved incision in order that the suture line would not come directly over the vertebral column. After splitting the spinous processes so as to include at least two healthy processes above and two below the diseased area, the wound was packed with a saline compress and then the tibial graft was removed, using a flexible probe to determine its length and shape. The graft included periosteum, cortex, endosteum and marrow. It was placed in the bed prepared by splitting and fracturing on one side the spinous processes and was sewed in firmly with kangaroo tendon. The patient was kept in bed about eight weeks after operation; and she left the infirmary July 27, 1921. Several radiographic examinations made since the operation and one only recently, about two years following the operation, show the tuberculous process in the spine to be completely arrested.

CASE II.—Mrs. C., 24 years old, has a negative family history. She gave a history of a fall about two years prior to operation. Suffered constantly with pain and soreness in the back, which was aggravated by lifting or stooping. Radiographic examination showed Pott's disease of the third and fourth lumbar vertebrae. Marked kyphosis was present. This condition was associated with a "cold abscess", which had burrowed down, retro-peritoneally, towards the right iliac region. Radiographic examination of the chest showed in both lungs, especially the upper lobes, considerable infiltration of a mottled appearance. Findings were characteristic of tuberculosis, very probably an active process.

Under gas-oxygen plus five per cent ether anesthesia, the Albee operation was performed at the Providence Infirmary, June 17, 1921, in the same manner as described in case 1, and the patient was kept in bed about eight weeks thereafter. The wound healed by first intention, and she has made a most excellent recovery. The sinus from the cold abscess healed completely before the patient left the infirmary, and now, about two years after the operation, the patient is doing her own housework, has gained thirty or forty pounds and is free of all symptoms.

No plaster cast or any other form of external appliance was used after operation in either case.

FRACTURE PAINS.

Do not control the pain of a fracture following the application of a splint by morphine. If the patient is having sufficient pain to require morphine you must assume that the splint has not been applied properly and is doing damage.—HOWARD L. BEYE in *The Journal of the Iowa State Medical Society.*

STONE IN RIGHT URETER OF SIX YEARS DURATION, RESEMBLING APPENDICITIS, PASSED AFTER CYSTOSCOPIC PROCEDURE.*

ALBERT M. CRANCE, M.D.
GENEVA, N. Y.

Because of the long duration of symptoms and their resemblance to those of appendicitis, and the absence of urological symptoms, the writer considers the following case worthy of reporting:

CASE A-315. The patient, referred by Dr. J. S. Allen, is a farmer, aged 26. He complained of pain in the right lower quadrant of the abdomen. The present trouble dates back over a period of six years, during which time he has had several repeated attacks of pain in this region, associated with vomiting and, at times, chills. On some occasions he had had a slight rise in temperature. There had never

Fig. 1. Roentgenogram showing shadow of suspected calculus.

been any particular urinary symptoms. On several occasions the present condition had been diagnosed elsewhere as being appendicitis, but he fortunately did not submit to surgical procedure. He stated that during the recent attack he noticed some pain referred to the right inguinal region and scrotum. The present attack had lasted for several days and had subsided to a considerable extent.

He was a well-nourished man, 5 feet, 10 inches in height, and examination showed nothing of especial importance except slight rigidity over the right rectus and a localized area of tenderness in the right lower quadrant somewhat below McBurney's point. He was admitted to the hospital February 13, 1923. A roentgenogram taken by Dr. W. E. Achilles showed a small pea-sized shadow, corresponding in location to the area of tenderness.

Cystoscopy showed a normal bladder. The ureteral orifices were normal in appearance, except that the right showed a slight redness. There was no gaping. A No. 6 x-ray catheter was passed about one and a half inches into the right ureter when definite obstruction was met. A roentgenogram taken at this time showed the shadow at the tip of the catheter. A ureterogram was then taken. The catheter was then withdrawn and a small filiform bougie inserted into the ureter.

Fig. 2. Roentgenogram showing the tip of the catheter against stone at the point where obstruction was met. A double exposure was made to show the relation of the stone to the catheter in a different position. (Photograph reversed by error.)

Twenty-four hours later the bougie was withdrawn. The patient did not complain of any particular amount of pain. The following day the patient was discharged with instructions to filter through gauze all urine passed. He returned to the office a month later with the stone in a bottle, stating that he had passed it on March 6th, or exactly 21 days following cystoscopy. The pain which he has felt constantly for six years has disappeared. The stone when carefully examined showed a flat area where it had apparently been adherent to the mucous membrane in the ureter.

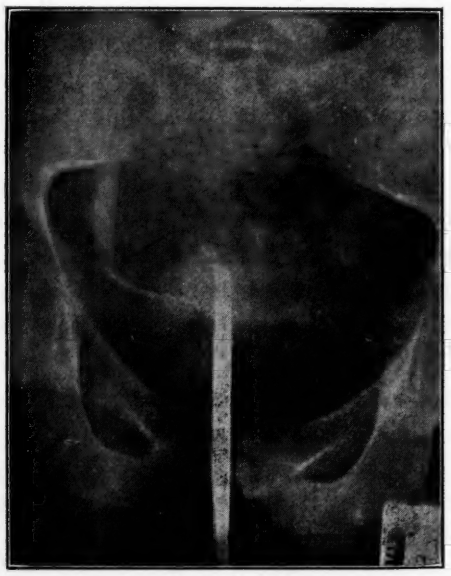

Fig. 3. Ureterogram showing that there was not complete obstruction and that there was slight dilatation of ureter above calculus.

*Read at the regular meeting of the Medical Staff, Geneva City Hospital, May 7, 1923.

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WALTER M. BRICKNER, B.S., M.D., F.A.C.S., *Editor*
New York City

ELMIRA, NEW YORK, SEPTEMBER, 1923

LONGEVITY OF PATHOGENIC BACTERIA IN THE TISSUES; ATTENUATION OF BACTERIAL VIRULENCE; CHRONIC BONE ABSCESSES.

The persistence in the body of pathogenic bacteria to which their host is, or has grown, immune is instanced, for example, in diphtheria bacilli in the throat, and typhoid bacilli in the gall-bladder, of "carriers". That the urethral crypts may harbor gonococci for many years is also generally known. But it is not only in the cavities and spaces of the body that bacteria may linger indefinitely without symptoms. The phenomenon also occurs in the solid tissues. Thus, a typhoid bone abscess may manifest itself many years after the enteric infection. We have seen the bacillus pyocyaneus, a secondary invader, apparently disappear from a wound that went on to healing and reappear when the same wound was reopened at a secondary operation. We have also seen actinomycosis in the groin, apparently definitively cured, reappear at intervals of six and seven years. The staphylococcus aureus, the common invader of bone, may lie dormant in the osseous tissue for many years after the storm of the acute osteomyelitis has passed, and then reveal its presence by some milder suppurative process.

This longevity of the staphylococcus in the bone is the explanation of chronic bone abscesses and other late suppurative processes. What perhaps is not sufficiently appreciated is that in these cases the organism has usually undergone much attenuation and that the late manifestation can be adequately dealt with by conservative surgical methods adapted to the greatly reduced infectivity. Walton Martin illustrated well his recognition of this in his contribution to the April, 1923, issue of *The Surgical Clinics of North America,* which was abstracted in the JOURNAL, June, 1923, page 167.

The pus in chronic abscesses of the bone may not merely contain attenuated organisms; we have shown that it may, even while the abscess is causing severe pain, be actually sterile. Based on the conception that chronic bone abscesses tend to become sterile or nearly so, we concluded some years ago that it was probably quite unnecessary to treat such pus collections by osteotomy over their entire length, and we devised the simple and effective procedure of merely draining them through a small drill hole. (*Annals of Surgery,* April, 1917; *Surgery, Gynecology and Obstetrics,* July, 1922; *The Journal of Bone and Joint Surgery,* July, 1923.) The method, briefly described on page 245 of this issue of the JOURNAL, replaces an extensive, major operation under ether, and an interminable period of convalescence, with a simple minor operation under laughing gas and cure within a few days. We have found it successful not only in chronic bone abscesses that proved to be sterile, but also, thus far, on those in which the pus contained living, but apparently attenuated, staphylococci.

The longevity of pathogenic organisms in the human tissues is a phenomenon that must be borne in mind in diagnosis; their attenuation is a phenomenon that may well be taken into consideration in surgical therapeusis.

NON-SURGICAL BILIARY DRAINAGE.

No diagnostic-therapeutic measure that has been introduced in medicine in recent years has been the subject of more discussion—of praise and of criticism—than the Meltzer-Lyon method of non-surgical drainage of the biliary tract. On the one hand have been the overenthusiastic followers of Lyon who have essayed to employ the procedure in cases in which it has not been suitable, including the many who share his confidence in the curative value of specific vaccines. On the other hand are those who, as the

result of careful bedside and experimental studies believe they have found defects in Lyon's conclusions, and those who, without due investigation, have brushed the method scornfully aside as diagnostically unnecessary or unreliable and therapeutically futile or dangerous.

Neither of these opposing groups is justified in its position. Diagnostically, it can no longer be disputed, for it has been repeatedly shown, that sometimes the Meltzer-Lyon test has discovered gall-bladder disease when it was not otherwise determined or even suspected, as, for example, in cases in which the irregular symptoms have been attributed to hypochondriasis or even to hyperthyroidism. Therapeutically, it would be hard, indeed, to gainsay in some, at least, of the cases of biliary tract disease that have been reported cured or greatly improved by continued non-surgical drainage, that this procedure has not been responsible for the result.

Now that Lyon has published his elaborate and illuminating monographic treatise* we are in better position to evaluate his contribution to medicine, to strike a balance between those who have praised unduly and those who have criticized unwisely. For the treatise is not by any means the intemperate exploitation of a fad by a misled enthusiast. It is, on the contrary, a thoroughgoing exposition of all the diagnostic measures that are useful in biliary-gastro-intestinal disorders and represents years of sober, scientific investigation.

Pointing out some of the fallacies in the major criticisms of his diagnostic procedure, and admitting limitations, Lyon shows clearly how valuable it may be—by gross observations of bile, mucus, etc., and by cytologic and bacteriologic studies of the fluids obtained—in determining the presence, location and character of an infection of the biliary tract. Therapeutically, he does not advance it as a cure-all and he describes the various groups of cases in which it should not be employed and those in which he finds it valuable before, after or in place of surgical intervention. Among the therapeutically eligible groups Lyon places, for example, "patients in whom, by means of a medical diagnostic drainage we can demonstrate the earlier beginnings of gall-tract disease, chiefly gall-bladder and duct catarrhs and infections, in a more reliable manner than is possible by any other diagnostic method. Many of these cases represent the latent, masked or unsuspected infections of the gall-tract. * * * This early stage of gall-tract disease is the one we must learn to recognize if we are to take the first practical step in the prevention of the later, more serious states * * *." Lyon also emphasizes that in these later states the diagnosis of the major lesion (e. g., cholecystitis, cholelithiasis) is not enough. We must "go back along the trail" and determine also what infection lurks within the biliary ducts that has produced the surgical climax and that may remain to produce symptoms after the surgical removal of stones or gall-bladder. That this contention has a sound basis finds support in the familiar observation that cholecystectomy does not by any means always remove all symptoms, even when no gross lesion outside the gall-bladder was found at operation.

The Lyon method requires precision of technic and much experience in interpreting findings. Even then these must be balanced with clinical judgment lest they lead one astray. It remains to be seen how generally the method will grow into acceptance either as a diagnostic routine or as a therapeutic resource. But it has passed the stage when one may deny that it has usefulness in either direction.

*B. B. Vincent Lyon: Non-Surgical Drainage of the Gall Tract, a treatise concerned with the diagnosis and treatment of certain diseases of the biliary and allied systems, in their relation to gastro-enterology and general clinical medicine. Lea and Febiger, 1923.

Progress in Surgery

Selections from Recent Literature

Early Mobilization in the Treatment of Fractures. HARRY C. SALTZSTEIN, Detroit. *The Journal of the Michigan State Medical Society*, July, 1923.

After adequate reduction the bone needs only support and protection. A slight bit of motion at the site of fracture distinctly favors and aids bony union because the loose osteogenetic cells are thereby irritated. A fractured rib—in the continual motion—rarely fails to unite. A fractured skull—absolutely immobile—shows the poorest osteogenesis of any bone in the body.

The pathological changes in the soft parts must next be absorbed. Upon the rapidity with which absorption takes place depends the degree of residual change and deformity. The tendon sheath, filled with fluid at first, soon shows filmy, structureless adhesions, and after two or three weeks immobilization there may be beginning plastic synovitis with round cell infiltration, and obliteration of the peri-tendonous spaces. Similarly, as a hemarthrosis recedes, delicate adhesions, mere strands of fibrin, remain. These become organized and vascular in eight to ten days. Early motion, when adhesions are films or fibrin and exudates are homogeneous serous fluids is much more effective than movement two or three weeks later when they are dense vascular bands, obliterative tenosynovitis, etc. The chief reparative agency in all these processes is the circulatory system. Consequently, therapy should continually maintain and give all aid to the local nutrition and should aim to prevent fibrous adhesions, plastic exudates, organized infiltrations ever forming.

The nutrition of a bone depends upon the state of activity of the muscles playing about it. When a muscle is rigidly fixed, it atrophies more quickly than almost any tissue in the body, because this tonus is lacking. Ten days immobilization of the quadriceps may leave a thigh which will not regain

the diameter, tone, etc., of its fellow of the opposite limb for two or three months. A foot-drop left for only two or three days may take two weeks to recover. The rapid muscular atrophy of a rigidly fixed limb brings on a rapid bone atrophy. Nothing will so aid bony repair as maintenance of muscular tonus with its dependent nutritive equilibrium. Slight but continual joint motions probably have a good deal to do with normal muscular tonus, and conversely the maintenance of muscular tonus about a joint prevents ankylosis. To prevent ankylosis and maintain tonus only slight movements are required, but they must take place frequently.

The Balkan frame suspension apparatus was the most popular method of fracture treatment developed during the war. The limb retained its continued slight motion, its muscle tonus, its joint sense, its full blood supply.

Mobilization of fractures is carried out by massage, passive motion, and active motion. One cannot get the best, or often any results by simply ordering a limb to have massage. The limitations and dangers of each manipulative procedure must be known and guarded against. The principles of massage and graded motion and their basis in the anatomy and physiology of the muscular system must be continually considered.

Massage being able only to increase blood supply, *per se* it cannot increase the bulk of strength of a muscle. What it does is relieve muscular spasm, and promote the absorption of exudate. Light, gentle stroking and friction are all that are needed. The whole limb should be massaged, and, until there is firm fibrous union, the immediate vicinity of the break should be avoided.

In passive motion, the normal movements should be copied; extend the fingers while flexing the wrist, extend the shoulder backwards while flexing the elbow. It is often of advantage to move the sound limb first, as this aids the higher physiological coordination. If there is pain, the movement is forced, and more harm than good ensues.

Nothing can supplant active voluntary motion in the prevention of muscular atrophy, and often a very little motion, if continued, will suffice. As a general statement, the patient's own active movements can do no harm, for he himself stops when the danger signal—pain—is noticed. No movement of any sort which causes pain should be allowed.

When the weakened muscle has moved the limb as far as possible, often an increased range of motion can be obtained with the assistance of various degrees of passive motion. This is called assistive motion. The assistance varies from a light finger touch to firm pulling.

Active and passive movements can be begun the second to the fourth day, removing the splints each day for the treatment. When begun this early great caution should be practiced, and unless operator and masseur are familiar with the pitfalls and danger signals, it is best to wait seven to ten days.

The Treatment of Chronic Bone Abscesses by Simple Evacuation Through a Small Drill Hole. Its Application in Non-Sterile Abscesses. WALTER M. BRICKNER, New York. *The Journal of Bone and Joint Surgery*, July, 1923.

In two earlier publications Brickner discussed the pathology of chronic bone abscesses and their diagnostic features, and described his method of treating such abscesses, small or large, by mere evacuation through a drill hole.

Under nitrous oxid narcosis, an incision is made through the skin and the underlying muscle if any is split, or retracted, to expose the periosteum. Through this and into the bone, at a point determined by roentgenogram or by the level of maximum tenderness, a drill about one-fourth inch in diameter is driven deep enough to permit the escape of pus. The drill is then removed and nothing else is introduced into the bone—no probe, curette, or gauze packing! A culture is made from the pus to determine what, if any, living organism it contains. A smear is also stained and examined at once. A small drain of folded rubber dam is laid in the soft parts down to, but *not into*, the opening of the bone, and the wound is otherwise closed by sutures. A simple gauze dressing completes the operation.

The drain is to provide for any further escape of pus from the bone, and to act as a safety-valve in case of possible suppuration in the bone cavity or the soft parts caused by dormant organisms awakened to activity. It is removed, usually without replacement, in 3 or 4 days, i. e., as soon as discharge has practically ceased. The small opening in the soft parts is then allowed to close and, ordinarily, healing of the entire wound is complete in 10 days or less, but few of which, usually, are spent in bed. Brickner contrasts this with the prolonged disability and invalidism, the scarring and deformity, of wide-open osteotomy and slow "healing from the bottom," with its inherent risks of sequestrum formation and secondary operations.

The method is based on the conception that chronic bone abscesses tend to become sterile and afebrile. Brickner has believed, however, that this procedure will also prove successful in some, at least, of those cases of chronic bone abscess in which clinical signs—daily mild elevation of temperature, slowly increasing pain and tenderness— indicate that the pus is not sterile, but that the virulence of the organisms is slight. He had previously reported such a case. In the present communication he shows, by two further cases, that complete sterility of the pus is not essential to the success of his method of treating chronic bone abscess.

The first case was that of a *cortical* abscess in the right tibia metastatic from a subsiding osteomyelitis of the left femur and tibia. The second case was that of a large *medullary* abscess in the right humerus of a syphilitic child who several years before had had acute osteomyelitis of the left tibia. Both were promptly cured by simple evacuation of the pus through a small bone opening, although in both cases the pus showed staphylococci on culture. In the first case smears showed a few gram-positive cocci; in the second case smears showed no organisms.

An abscess in the bone substance (corticalis) usually shows clearly in the roentgenogram, but an abscess within the medullary canal usually cannot be recognized as such, roentgenographically. The *x*-ray appearance then is that of the associated osteoperiostitis, by which the abscess can be diagnosed only in connection with the clinical signs—pain and tenderness.

While in all of the cases of bone abscess in which Brickner employed simple drainage through a small drill hole, immediate relief and early, and therefore permanent healing were secured, he is prepared to believe that this will not always happen. It is conceivable that, as the result of introducing a secondary infection or of the awakening into activity of dormant organisms suppuration may continue and require further operation. Even accepting such a possibility, however, there is much to be gained and little to be lost by a trial of this simple minor operation. The procedure is curative not merely in chronic, sterile bone abscesses, but also in those chronic (and subacute?) bone abscesses in which living organisms are still present but not virulent. The method is *not* recommended for acute pyogenic bone infection with high fever.

Ether Lavage: Its Logical Use, Locally, as an Anti-Aggressin. GEORGE DE TARNOWSKY, Chicago. *Surgery, Gynecology and Obstetrics*, July, 1923.

Ether lavage is a local and general adjuvant to Nature's combative and reparative forces, i. e., it is an anti-aggressin. Whenever, from any pelvic or abdominal source of infection, free or localized pus is found, the organ or organs involved are first of all treated according to indications. Pus is wiped or preferably suctioned without breaking down protective barriers—if any exist—and the surgeon begins to close the peritoneum. While doing this, one ounce of ether is poured into the pelvic or peritoneal cavity, without attempting to wash or otherwise disturb the normal relation of any of the abdomino-pelvic organs. No swabbing out is done, but the peritoneum is closed as rapidly as possible in order to minimize the loss of ether through evaporation. The anesthetic is not interrupted.

Drainage, exclusively of the cigarette variety, should be instituted only in cases where it has been impossible to remove all macroscopically necrotic tissue or where a fistula is either present and cannot be closed, or is probably going to occur.

While admitting the fact that present-day indications for drainage have markedly lessened through improvement in technic and an increasing confidence in the protective and reparative forces of the peritoneum and other serous sacs,

Tarnowsky is closing, without drainage, pelvic and abdominal incisions which he certainly would drain if ether were omitted.

Ether lavage is not advocated on account of its bactericidal power. In contact with living tissues ether volatilizes in 20 seconds, disseminates rapidly as a vapor and is slowly absorbed without leaving any residue. Experimentally and clinically, ether has been proved to be an anti-aggressin, producing or increasing leucocytosis and therefore aiding Nature's defenses against infection.

False Diverticula of the Jejunum. FRANK HELVESTINE, JR., University, Virginia. *Surgery, Gynecology and Obstetrics,* July, 1923.

Acquired diverticula of the jejunum occur relatively rarely. Most cases are seen in old individuals. The diverticula in the majority of cases are of the false type and occur along the mesenteric border of the intestine. There is a definite spatial relation between the mesenteric vessels and the diverticula.

Intra-abdominal pressure, caused by rectal or vesical tenesmus, is perhaps the force causing the development of diverticula. Atrophy of the intestinal muscle, especially the inner circular layer, is a predisposing factor in the formation of the diverticula. Local traction upon the gut by adhesion or by the mesenteric vessels when shortened following sclerosis, is probably the initial cause of the formation of these diverticula in the author's cases.

Acquired diverticula, in the earliest stages of formation, are of the true type, and may continue to develop as true diverticula. In the majority of cases, however, the muscle fibers disappear by degeneration and the diverticula develop as false diverticula.

Diverticulum of the Duodenum. With Report of a Case in which the Diverticulum Was Imbedded in the Head of the Pancreas, and a Method for Its Removal. NEIL JOHN MACLEAN, Winnipeg, Manitoba. *Surgery, Gynecology and Obstetrics,* July, 1923.

MacLean reports a case that demonstrates the importance of a pre-operative diagnosis and localization of the diverticulum, and shows how readily this condition can be missed at an exploratory operation.

A duodenal diverticulum having been demonstrated by the *x*-ray, it would be for the clinician to decide whether it was a case of diverticulosis or diverticulitis. Furthermore, the surgeon in operating, if he finds an associated pathology more likely to be causing the symptoms than the diverticulum, would be wise to deal with that primarily, and await results.

The Retained Gall-Bladder: Its Complications, and the Difficulties and Disadvantages of Secondary Cholecystectomy. DEWITT STETTEN, New York. *American Journal of the Medical Sciences,* July, 1923.

If we operate on the gall-bladder then a primary cholecystectomy should be performed, if this is at all possible, irrespective of the degree of structural change in the gall-bladder itself. If, for any reason, either on account of the general condition of the patient or because of local difficulties, primary cholecystectomy cannot be performed and only cholecystostomy is done, this should be looked upon as an emergency procedure. A secondary cholecystectomy should be practiced when the patient's condition has improved, unless there are specific contraindications. Reoperation is in many cases not a matter of choice but of compulsion. The one only exception to this rule is irremediable occlusion of the common duct, such as carcinoma of the head of the pancreas or impermeable stricture. Here the gall-bladder must be retained for the anastomosis with some part of the gastrointestinal tract. In chronic pancreatitis with jaundice, cholecystostomy should first be performed and, after the fistula has closed without symptoms so that the patency of the common duct is assured, secondary cholecystectomy should be undertaken. In chronic pancreatitis without jaundice, primary cholecystectomy is the operation indicated. In certain cases of so-called "silent" gall-stones, accidentally discovered during the course of a laparotomy for some other condition, where the gall-bladder is found to be comparatively normal, Stetten on several occasions practiced "ideal cholecystectomy," closing the abdomen without drainage. This conserves the more or less healthy gall-bladder and obviates the disadvantages of cholecystostomy.

The retention of the diseased gall-bladder will produce many more and denser adhesions than its removal. This is particularly true with the technic which Stetten is now using, with complete success up to date—cholecystectomy without drainage.

Atrophy of the Liver with Nodular Hyperplasia. EUGENE H. POOL and FRED W. BANCROFT, New York. *Surgery, Gynecology and Obstetrics,* July, 1923.

The operative findings of acute yellow atrophy with nodular hyperplasia are characteristic and should be identified at once. The liver is small with sharp, knife-like edge; the surface presents a hyperemic appearance or a yellow tint. A section of one of the nodules does not show the characteristic lesion; therefore biopsy should include liver tissue independent of the nodule, since this tissue shows the characteristic atrophy of the lesion.

Tuberculosis of the Kidney. DANIEL N. EISENDRATH, Chicago. *International Clinics,* Vol. II. (33rd Series), 1923. (J. B. Lippincott Company.)

Tuberculosis of the kidney is essentially a blood-borne unilateral affection. The only exceptions to this are cases in which one or, more commonly, both kidneys are involved in a generalized miliary tuberculosis. Clinically, such cases can be left out of consideration because it is impossible to distinguish the signs of renal invasion from those due to the generalized systemic infection. Such cases are generally hopeless.

The form of renal tuberculosis with which the clinician comes in contact is a disease in which the changes in the kidney take place very slowly as a rule. Although the lesions which we find in the removed kidney must have required months to develop, cases are encountered clinically in which the symptoms have existed only a few weeks. These are in the majority of instances of mixed infection, the acuity of the symptoms being due to the ordinary pyogenic organisms such as the streptococci, staphylococci or even colon bacilli.

A primary tuberculous focus, outside of the kidney undoubtedly exists, but it is usually difficult to demonstrate clinically. The renal localization is invariably secondary to a focus in some other part of the body. The extent of the latter plays an important rôle in considering the indication for, as well as the prognosis after, operation in cases of renal tuberculosis. The concomitant presence of an advanced pulmonary, peritoneal, genital or osseous tuberculosis is a contraindication to nephrectomy. A thorough general examination should be made before deciding upon removal of a tuberculous kidney, even though the urologic data reveal the presence of an advanced stage of the disease.

It is now generally agreed that the point of primary localization of the organism is in the niche between the papilla and a secondary calyx. From such a focus the infection spreads by way of the intrarenal lymphatics into all portions of the parenchyma.

The same changes that characterize tuberculosis in other parts of the body are found in the kidney. In an early stage one sees ulceration of one or more papillae with perhaps a few small cavities and tubercles scattered throughout the kidney. A little later an entire pole will be found to be the seat of cavity formation. In the final stages one finds a series of cavities each filled with caseous detritus, a condition known as tuberculous pyonephrosis, with scarcely a trace of parenchyma.

In some cases the changes in the kidney itself are minimal compared to those in the perinephric tissues, renal pelvis and ureter. We may find the kidney imbedded in a mass of fibrous tissue representing hyperplastic changes in the perinephric tissues similar to those found in tuberculosis of the cecum or fallopian tubes. On the other hand, perforation of an abscess may occur, resulting in extensive suppuration around the kidney, even spontaneously perforating the skin of the lumbar region.

In a small number of cases one finds that there are a few scattered tubercles in the renal parenchyma and renal pelvis associated with a stricture at some point in the ureter resulting in a hydro-ureter and hydro-nephrosis whose specific tuberculous origin can be easily overlooked.

Stricture of the Bulbous Region. GERMAN DIAZ LOMBARDO, Mexico City, Mexico. *Surgery, Gynecology and Obstetrics*, July, 1923.

Dilatation of the posterior urethra, which is generally infected, probably results in retention of small quantities of urine, and that, in turn, leads to chronic inflammation of the region and of the verumontanum. This last condition is associated with some important symptoms, among which may be mentioned impotence, urethral neuralgias, and neurasthenia. Patients thus afflicted and incorrectly treated by means of dilatation and catheterization get well under the treatment, but when catheterization is suspended, the condition promptly recurs, and with each recurrence the urethral symptoms and the local and general manifestations are more marked and rebellious to treatment. For this reason Lombardo has adopted the practice of operating upon these cases.

The technic consists in making a large, internal, urethrotomy (Otis), so as to insert at the point of stricture a No. 60 Beniqué. An external urethrotomy is made to reach the neck of the bladder, which is dilated from 1.5 to 2 cm. If necessary little cuts are made in it. Treatment of the cavity, which is the result of dilatation of the posterior urethra, consists either in breaking up the adhesions of the posterior wall of the urethra to the posterior urethral wall when the cavity is not large, or if the cavity is large in resection of a portion of urethra from the prostatic and membranous region. As, for 3 or 4 days, the posterior urethra is canalized by the perineal section, this drainage assists the disinfection of the cavity, and, therefore, the treatment is complete.

The Interrelation of Gynecology and Urology. H. M. N. WYNNE, Minneapolis. *Minnesota Medicine*, July, 1923.

Wynne describes various conditions illustrating that gynecological and urological signs and symptoms are, in a considerable percentage of cases, confusing and frequently require careful study of both the reproductive and urinary systems before a correct diagnosis can be made and intelligent treatment carried out.

Pathological lesions primary in the reproductive organs may directly or indirectly cause serious disease of the urinary system.

Syphilis of the Uterus and Adnexa. BERNARD PORTIS, Chicago. *Surgery, Gynecology and Obstetrics*, July, 1923.

Syphilis of the body of the uterus is rare. For most of the lesions which have been described as luetic, the specific character has not been established and appears doubtful. Gummata have been reported; these lesions may probably be accepted as luetic, in spite of the fact that treponemas have not been demonstrated in them.

A case of early diffuse syphilitic involvement of the body of the uterus is described. The character of the process was established by the presence of the specific organism in th cellular tissue which separates the muscle bundles. The lesion of the body was apparently secondary to a chancre of the cervix. Involvement of the body probably occurred by direct interstitial invasion from the primary lesion.

Adnexal lesions, the syphilitic character of which has been definitely proven, are even rarer than those of the body of the uterus. Chronic vascular and diffuse fibrotic processes have been reported as of luetic origin, but most of these must be excluded because of lack of evidence.

Radium in the Treatment of Uterine Hemorrhage, with a Report Upon Forty-five Cases. SIDNEY FORSDIKE, London. *The Lancet*, June 30, 1923.

The type of case under consideration is the "bleeding uterus;" more commonly, it is labelled chronic metritis fibrosis uteri, or chronic subinvolution. However debatable the pathology, the one distinctive clinical feature is excessive and uncontrollable hemorrhage with absence of any pelvic lesion to account for it. The series of cases does not include those with ordinary causes of hemorrhage; it includes only cases which had been dealt with in the usual way and had proved refractory to treatment. The criteria by which cases were selected were: (a) The persistence of severe hemorrhage after operative treatment; (b) an advanced anemia, with shortness of breath, headaches, edema of legs, etc., which had been treated palliatively for some time; (c) cases where the patient had to spend some part of each month in bed.

Radium treatment should be the method of choice in all uncomplicated cases of severe and persistent hemorrhage due to chronic metritis, inflammatory disease of the tubes and ovaries constituting the sole contraindication.

The radium menopause is not usually accompanied by any symptoms attributable to action upon the ovaries, and of all methods it produces the least disturbance of the patient's economic life.

The Reliability of the Sero-diagnosis of Syphilis in Pregnancy, During Labor and in the Puerperium. (*Die Zuverlässigkeit der Serodiagnostik der Lues in der Schwangerschaft, unter der Geburt und im Wochenbett.*) L. HANDORN und F. GEORGI, *Zentralblatt für Gynäkologie*, 1923 **47**, 898, No. 23.

Doubt has frequently been cast on the specificity of the Wassermann reaction in pregnancy. Yet the clinical importance of detecting lues is greater here than in any other condition. The authors examined 78 healthy women throughout pregnancy. Retroplacental and cord blood are not reliable, but blood from the arm veins is. In two cases both the Wassermann and Sachs-Georgi reactions were positive, in clinically healthy women, but as a positive reaction persisted for at least two months post-partum, a latent syphilis and not a non-specific pregnancy reaction must be blamed.

The Influence Exerted by Typhus and Relapsing Fever upon Menstruation, Pregnancy, Labor and Lactation. (*Ueber den Einfluss des Fleck- und Rückfallfiebers auf die Menstruation, Schwangerschaft, Geburt und Laktation.*) S. WEISSENBERG. *Zentralblatt für Gynäkologie*, 1923, **47**, 904, No. 23.

In Russia about 1 of every 10 persons has now had typhus. From large statistics Weissenberg concludes that neither typhus nor relapsing fever produces gynecological complications and that these diseases favor the appearance of amenorrhea rather than menorrhagia.

Relapsing fever causes interruption of pregnancy more frequently than does typhus. Abortion in the early months is commonest, the tendency to interruption decreasing progressively toward term.

The prognosis is not unfavorably influenced by either pregnancy or abortion. The degree of fever and the severity of the course have no connection with the symptoms of menstruation, pregnancy or labor.

Hemorrhages of the Brain During Puerperal Eclampsia. (*Hémorragies des Centres Nerveux au Cours de l'Éclampsie Puerpérale*). LEVANT et L. PORTES. *Gynecologie et Obstetrique*, 1923, **7**, 332, No. 4.

The authors have sifted the French literature. They find only 48 cases verified by autopsy or lumbar puncture. The incidence of cerebral hemorrhage is about 27%. The most frequent site is ventricular. The clinical signs are sudden death accompanied by marked cyanosis, or hemiplegia or abnormally persistent coma with marked thermal disturbances.

If recovery follows, a rare outcome, hemiplegia with or without aphasia may persist. Syphilitic endarteritis appears to be etiologically important in some cases. No case of medullary hemorrhage in eclampsia has ever been demonstrated.

Closure of the Vagina. (*Le Cloisonnement Du Vagin.*) HENRI HARTMANN. *Gynecologie et Obstetrique*, 1923, **7**, 415, No. 5.

Hartmann again emphasizes the value of the modified Le Fort operation for complete prolapse in old women, who cannot undergo more radical procedures. Under local anesthesia, a broad parallelogram of mucosa is resected anteriorly and posteriorly extending from near the cervix to near the meatus and fourchette. The anterior and posterior denuded surfaces are approximated by buried, absorbable sutures which are started near the cervix. By this operation the prolapse is kept back permanently.

Removal of Adhesive Bandage. HARPER E. ZOLLER, Detroit. *Journal of the A. M. A.*, July 7, 1923.

Adhesive bandage can readily and painlessly be removed by moistening the bandage with a little pure ethyl acetate in absorbent cotton, sopping lightly over the entire surface of the bandage or tape. In a few seconds the adhesive surface is killed and the bandage can be pulled free from the skin or hairy surface without the least "pull."

Book Reviews

Diseases of the Rectum, Anus, and Colon. By SAMUEL GOODWIN GANT, M.D., LL.D., Professor and Chief of the Department for Diseases of the Colon, Rectum and Anus, at the Broad Street Hospital, Graduate School of Medicine, New York City; formerly Professor of Diseases of the Colon, Rectum and Anus, New York Postgraduate Medical School and Hospital; etc. Three octavo volumes; 1616 pages; 1128 illustrations with 10 insets in colors. Philadelphia and London: W. B. SAUNDERS COMPANY, 1923.

This work on diseases of the rectum and anus, the colon, ilio-colic angle and appendix, is in no way a mere revision of any previous text-book of the author's. It is an altogether new production and constitutes a large treatise, divided into three volumes of convenient size.

The work is essentially a personal one, descriptive chiefly of the author's methods, with, for the most part, but brief mention of operations devised by other surgeons. Bibliographic references are entirely omitted. The work is intended to be a practical source of instruction on diagnosis and treatment—chiefly by the methods preferred by the author and according to his own technics. It is obviously not intended to be, beyond this, a reference work in the larger sense.

The illustrations are very numerous and clear; the descriptive matter, especially as it concerns diagnosis and therapeutic measures, likewise clear and quite to the point.

It is interesting to note that while at one time Gant advocated the cautery operation as his preference for hemorrhoidectomy, now that he employs local anesthesia he prefers the ligature operation as performed by the technic he describes—one of the unusual features of which is that no stretching of the sphincter is required or undertaken.

Surgical "Don'ts" (and "Do's"). By C. HAMILTON WHITEFORD, M.R.C.S., L.R.C.P., Honorary Surgeon to the Plymouth Infirmary; etc. Duodecimo; 46 pages. London: HARRISON & SONS, 1923.

This booklet is a reprint of ten articles published during the past thirteen years, many of them in the *Medical Press*.

It consists of terse bits of advise concerning surgical practice in general and certain surgical conditions in particular. Though much smaller and of more limited scope, it resembles the "Surgical Suggestions" written by members of the editorial staff of this JOURNAL and published through various editions (including a German translation), the last being "1000 Surgical Suggestions."

Clinical Symptomatology of Internal Diseases. Part II. Generalized Pain. By PROF. DR. NORBERT ORTNER, Vienna. Translated from the 2nd German Edition by FRANCIS J. REBMAN. With an Introduction by THOMAS WERSTER EDGAR, M.D., New York. Octavo; 596 pages, New York: MEDICAL ART AGENCY, 1922.

Following upon a book entitled, *Abdominal Pain*, Ortner has presented a very careful analysis of all other forms of pain that arise from internal diseases. Insofar as pain enters into symptomatology, with reference to areas non-abdominal, this volume supplies a very valuable guide for differential diagnosis. The general plan is one of analysis of pain on the basis of its clinical diagnostic importance, hence a method of discussion which recognizes the numerous pitfalls in diagnosis.

The wide experience of the author is everywhere manifest in his consideration of the allied symptoms that help to serve as interpreters of the pathological conditions giving rise to the sensation of pain. No single volume affords a wider range of description of pain, and, while larger than a monograph, it is a welcome addition to the reference shelf of those who seek to apply medical logic and analysis in diagnosis.

The classification of the contents is regional, with successful subdivision according to the special organs involved. The translator has been fairly successful in breaking up the heavy German style, but has retained occasional terms, which, while technically correct, are not generally current in the English literature.

Transactions of the American Proctologic Society. Twenty-third Annual Session, St. Louis, Missouri. Octavo; 124 pages. New York: PAUL B. HOEBER, 1923.

The *Transactions* consists of a collection of nineteen papers read by members at the Society meeting, interlarded with much discussion. Granville S. Hanes, in his presidential address discussed anal pruritus and his discovery of a method of cure. He found in cases of pruritus, but not in others, that a probe, when inserted into an opening at the anal muco-cutaneous border, could be passed easily into the surrounding subcutaneous tissue in all directions, which suggested to him that this tissue was so lacking in vitality as to be almost necrotic and to present areas of potential cavity formation. This pathological condition of the subcutaneous tissue is considered the principal factor in the production of pruritus, and the cure depends upon the destruction of the tissue and the obliteration of the potential cavities. The cure is accomplished by the injection into the pathological subcutaneous area of 50 cc. of a ½% solution of novocain and 60 cc. of a 1-2000 solution of hydrochloric acid. Hane's method of reasoning in determining to use hydrochloric acid is quite illogical, and, though the cures reported in cases of anal pruritus are pleasantly surprising to those who have tried the customary methods with slight success, his further report of using the injection as a panacea for almost any condition he met in his practice detracts tremendously from the reliability of his method.

John L. Jeeks reported what he considers the first case of cure of the exudate type of tuberculous peritonitis by the introduction of oxygen into the peritoneal cavity.

Propédeutique et Technique Urologiques. Par G WIENER, Ancien urologue adjoint à l'Hôpital Saint-Pierre de Bruxelles. Volume en 8; 492 pages; 153 figures. Paris: MASSON ET CIE, 1922.

Since innovations and discoveries constantly take place in all branches of medicine, it is desirable to have, from time to time, a compendium of all the useful knowledge in each branch. Wiener's book serves such a purpose for urology. In general it is the common enough type of text-book of urology which deals in detail with a study of urine, instrumentation, asepsis and antisepsis, and the examination and treatment of the various portions of the genito-urinary tract from the meatus *ad seriatim* to the kidneys.

There are, however, two commendable chapters. One deals with genito-urinary disease symptomatology, and under the head of each symptom are discussed the various etiological possibilities and differential diagnosis, as, for example, of pain, fever, anuria, incontinence, pyuria, and hematuria. The other chapter describes in full the methods for superficial and deep local anesthesia for operations upon the genito-urinary tract; forms of anesthesia comparatively seldom employed in this country, but extensively used in Europe, and the study of which will probably prove profitable to the American reader.

The Form and Functions of the Central Nervous System. An Introduction to the Study of Nervous Diseases. By FREDERICK TILNEY, M.D., Ph.D., Professor of Neurology, Columbia University; Attending Neurologist, the Presbyterian Hospital, and the New York Neurological Institute; Consulting Neurologist, Roosevelt Hospital, New York, and HENRY ALSOP RILEY, A.M., M.D., Associate in Neurology, Columbia University; Associate Attending Neurologist, New York Neurological Institute; Attending Physician, Neurological Department, Vanderbilt Clinic, New York. *Second Edition.* Imperial octavo; 1019 pages; 763 illustrations of which 56 are colored. New York: PAUL B. HOEBER, 1922.

This is a large and handsome treatise on the anatomy and physiology of the brain and spinal cord in which, so far as they are known, the functions of various areas, segments, nuclei and tracts, are elucidated and impressed upon the reader by clinical citations. The work is elaborate and represents not only knowledge previously acquired by others, but also experimental, anatomical and clinical investigations in the department of neurology at the New York College of Physicians and Surgeons. This edition, appearing but two years after the first, shows only minor changes and corrections.